

PAGE'S WEEKLY

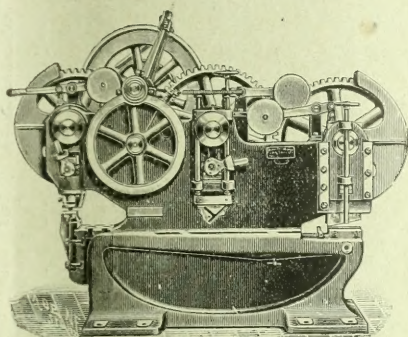
**A Weekly Newspaper Devoted to the Engineering, Shipbuilding,
Iron and Steel Trades.**

OFFICES: CLUN HOUSE, SURREY STREET, STRAND, LONDON, W.C.

No. 78. VOL. 8.
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LONDON, FRIDAY, MARCH 5, 1906.

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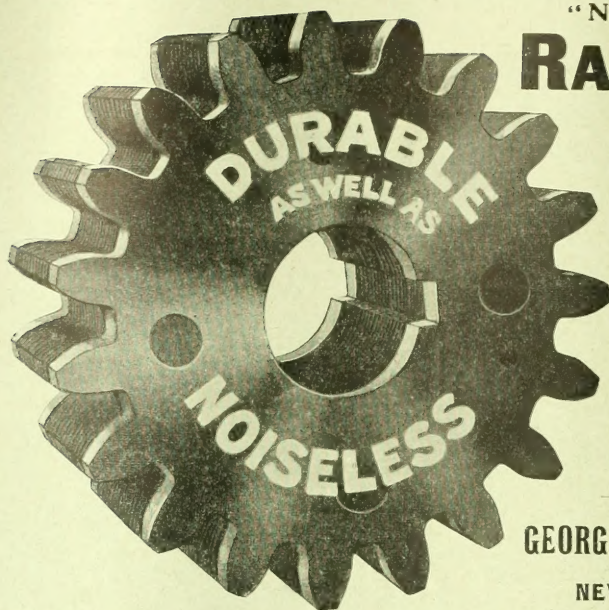
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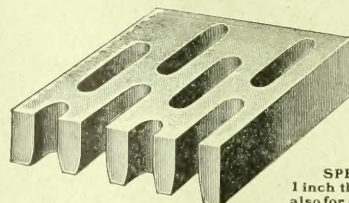
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Miscellaneous

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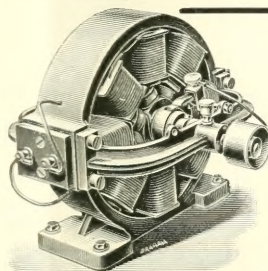
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A. MOUNT-HAES,

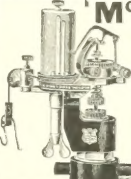
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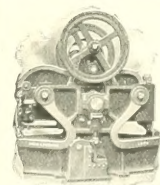
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Miscellaneous

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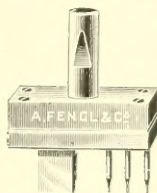
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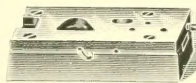
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Miscellaneous

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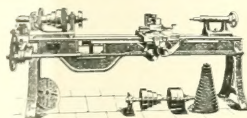
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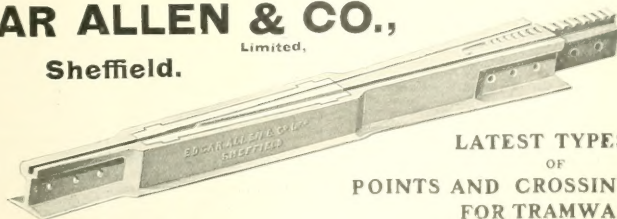
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PAGE'S WEEKLY

Contracts

CONTRACTS.

EAST INDIAN RAILWAY.—The East Indian Railway Company is prepared to receive TENDERS for the SUPPLY and DELIVERY of—

1. STEEL POSTS, &c., for Fencing.
2. GALVANISED EYE BOLTS and STRAND WIRE for Fencing.

as per Specification to be seen at the Company's Offices.

Tenders are to be sent to the undersigned, marked "Tender for Steel Posts, &c.," or as the case may be, not later than Twelve o'clock noon, on Wednesday, the 14th day of March, instant.

The Company reserves to itself the right to divide the order, also to decline any Tender without assigning a reason, and does not bind itself to accept the lowest or any Tender.

For each Specification a fee of £1 is charged, which cannot under any circumstances be returned.

By order,

C. W. YOUNG,

Secretary.

Nicholas Lane, London, E.C.,
March 1-1, 1906.

MUNICIPAL COUNCIL OF SYDNEY, N.S.W. ELECTRICITY DEPARTMENT.

The Council is prepared to receive TENDERS for the SUPPLY and EXECUTION of—

- A. BOILERS, AUTOMATIC STOKERS, PIPEWORK, &c.
- B. TURBO-ALTERNATOR, SUB-STATION MACHINERY, SWITCHBOARDS, &c.

Specifications, Plans, and Form of Tender may be obtained on application to Mr. T. ROOKE, at the offices of Messrs. Preece and Cardew, 8, Queen Anne's Gate, Westminster, on and after Monday, February 12th.

A deposit of Five Guineas will be required on application, which will be refunded on receipt of a bona fide Tender as directed, and a cash deposit or marked cheque for the sum of £1,000 will be required when the Tender is sent in.

Sealed Tenders, endorsed "Tender for Electric Lighting Plant," are to be addressed to the Town Clerk, Town Hall, Sydney, and must be delivered at the Town Hall on or before 4 p.m. Monday, May 7th, 1906. The Council does not bind itself to accept the lowest or any Tender.

(Signed)

THOMAS H. NESBITT,
Town Clerk.

EDINBURGH CORPORATION. ELECTRICITY SUPPLY.

The Lord Provost, Magistrates, and Council of the City of Edinburgh are prepared to receive TENDERS for the following MATERIAL for the Electricity Supply Department for the year from May 16th, 1906.

1. ARC LAMP CARBONS.
2. CAST-IRON PAVEMENT BOXES and CAST-IRON PIPES.
3. ELECTRICITY METERS.
4. HOUSE SERVICE FUSE BOXES.
5. BITUMEN.

Specifications and Forms of Tender can be obtained at the Engineer's Office, 5, Dewar Place, Edinburgh, on payment of a deposit of £1 is, for each Specification, which will be refunded on receipt of a bona fide Tender along with the Specification and Drawings.

Sealed Tenders, endorsed with the title of the Specification, must be sent to the Town Clerk, City Chambers, Edinburgh, not later than Monday, March 12th, 1906.

FRANK A. NEWINGTON, Engineer.

Electricity Supply Station, Edinburgh,
February 20th, 1906.

BOROUGH OF WIMBLEDON. ANNUAL CONTRACTS.

The CORPORATION are prepared to receive TENDERS for the EXECUTION and SUPPLY during the Year ending March 31st, 1907, of the FOLLOWING WORKS, MATERIALS, etc., namely—

ELECTRICITY DEPARTMENT.

1. Engine-Room Stores.
2. Cables.
3. Joint-Boxes and Jointing Material.
4. Transformers.
5. Meters.
6. Lubricating Oils.
7. Incandescent Electric Lamps, Carbons, and Accessories.
8. Castings.
9. Firebricks and Fireclay.

Forms of Specifications and Tender, with Conditions of Contract, may be obtained, and Samples inspected, on application to the Chief Electrical Engineer, Electric Light Works, Durness Road, Wimbledon.

Sealed Tenders, endorsed "Tender for —," must be addressed to me and delivered at my offices before noon on Saturday, the 17th day of March, 1906.

The lowest or any Tender will not necessarily be accepted.

By order,

A. STEELE SHELTON,

Town Clerk's Office, Wimbledon,
February 15th, 1906.

THE URBAN DISTRICT COUNCIL OF BARNES.

ELECTRICITY DEPARTMENT.

The Urban District Council of Barnes are prepared to receive TENDERS for the Supply, Delivery, and Erection of—

- Section 3. ONE STRAIGHT-TUBE-TYPE WATER-TUBE BOILER.
- Section 5. SURFACE CONDENSER, FEED PUMP AND PIPEWORK.

Specifications and Drawings, together with General Conditions and Form of Tender, may be obtained from the undersigned on payment of a deposit of one guinea for each section, which will be returned on receipt of a bona fide Tender.

Tenders to be sealed and endorsed "Boiler," and "Condenser," and delivered to the Clerk, Council House, High Street, Mortlake, S.W., not later than March 12th, 1906.

The Council do not bind themselves to accept the lowest or any Tender.

C. S. DAVIDSON,

Electrical Engineer.

Electricity Works, High Street, Mortlake, S.W.

ASYLUMS COMMITTEE OF THE LONDON COUNTY COUNCIL.

The Asylums Committee of the London County Council are prepared to receive TENDERS for the INSTALLATION of ELECTRIC LIGHTING and POWER (excluding Generating Plant) at the Long Grove Asylum, Epsom, Surrey, now in course of erection.

Instructions for Tender and Forms of Tender and Contract, with Specification and Schedules thereto annexed, together with plans and cover, can be obtained from the Clerk of the Committee, No. 6, Waterloo Place, London, S.W., on or after Monday, the 20th inst., on payment of a deposit of £5 for each copy.

The amount deposited will, after the Committee have come to a decision upon the Tenders received, but not before, be returned to the Tenderer, provided he shall have sent in a bona fide Tender and shall not have withdrawn the same.

Tenders must be on the printed form, and must be accompanied by the Form of Contract and Schedules thereto and bond.

The Tender and accompanying documents, completed in accordance with the instructions, must be enclosed in the authorised sealed cover, endorsed "Tender for Electric Lighting, Long Grove Asylum," and be delivered at the office of the Committee, 6, Waterloo Place, London, S.W., on or before Monday, the 20th of March, 1906, after which no Tender will be received.

Any Tender not made on the printed form, or not filled up and complete in every particular in accordance with the instructions, may be rejected.

The Committee do not bind themselves to accept the lowest or any Tender.

The Contractor will have to enter into a bond in the penal sum of £500, with two approved sureties, each in the sum of £400, as security for the due performance of the contract.

H. F. KEENE,

Clerk of the Asylums Committee.
Asylums Committee Office, 6, Waterloo Place,
February 21st, 1906.

CITY AND COUNTY BOROUGH OF BELFAST.

TRAMWAYS AND ELECTRICITY DEPARTMENT.

The Tramways and Electricity Committee of the Belfast Corporation are prepared to receive TENDERS for—

ONE 400 KILOWATT STEAM DYNAMO.

Specification, with Form of Contract, may be obtained from the undersigned, on payment of Two Guineas, which will be refunded provided a bona fide Tender has been sent and not withdrawn.

Sealed Tenders, endorsed "Tender for Steam Dynamo," shall be lodged with Sir SAMUEL BLACK, Town Hall, Belfast, not later than 11 a.m. on Monday, the 19th day of March, 1906.

The Council do not bind themselves to accept the lowest or any Tender.

VICTOR A. H. MCOWEN, M.Inst.E.E., M.I.Mech.E.,
City Electrical Engineer, Belfast.

COUNTY BOROUGH OF WARRINGTON. ELECTRICITY DEPARTMENT.

The Electricity and Tramways Committee of the County Borough of Warrington are prepared to receive TENDERS for HIGH and LOW TENSION CABLES.

Specification and Form of Tender may be obtained on application to F. V. L. MATHIAS, A.M.I.E.E., Borough Electrical and Tramways Engineer, Howley, Warrington, on payment of One Guinea, which will be returned on receipt of a bona fide Tender.

Tenders, addressed to the Chairman of the Electricity and Tramways Committee, Town Hall, Warrington, must be sealed with wax and endorsed "Tender for High and Low Tension Cables," and delivered not later than 12 o'clock noon, on Tuesday, March 13th, 1906.

The lowest or any Tender will not necessarily be accepted.

J. LEON WHITTE,

Town Hall, Warrington. Town Clerk.

PAGE'S WEEKLY

Contracts and Appointments Open

CITY OF LEEDS.—ELECTRIC LIGHTING DEPARTMENT.

TURBO-ALTERNATORS, CONDENSERS, &c.

The Electricity Committee of the Leeds City Council are prepared to receive TENDERS for PLANT as below—

One or Two Sets of Electric Generating and Condensing Plant, each comprising a Steam Turbine, Two-phase Alternator and Exciter of 3,000 kw. capacity, Electrically driven Surface Condensing Plant, and the necessary Pipes and Valves.

Tenders must include the whole of the work specified, as offers of separate sections will not be considered. Preference will be given to Tenders for Plant of British Manufacture. Copies of the General Conditions, Specification, and Form of Tender, may be obtained from Mr. HAROLD DICKINSON, Manager of the Department, 1, Whitehall Road, Leeds, on payment of a deposit of Two Guineas, which will be refunded on receipt of a *bona fide* Tender.

Tenders must be in the form attached to the Specification, and must be delivered to me at the Town Hall, Leeds, not later than 5 o'clock in the forenoon, on Monday, the 9th day of April, 1906, in sealed envelopes, endorsed "Electric Lighting—Tender for Generating Plant."

The Corporation do not bind themselves to accept the lowest or any of the Tenders sent.

ROBERT E. FOX,

Town Clerk.

CORPORATION OF GREENOCK.

The Corporation of Greenock are prepared to receive Tenders for Supply and Erection of—

CONTRACT NO. 10.

COMPLETE REFUSE DESTRUCTOR PLANT.

The General Conditions, Specification, Drawings and Form of Tender may be obtained from the Burgh Electrical Engineer, Greenock, on and after the 5th March, on payment of a deposit of £2 2s., which will be returned if a *bona fide* Tender is received within the time stated below.

Extra copies of Specification may be obtained on payment of 5s. each, which will not be returned.

Tenders, addressed to the Town Clerk, and endorsed "Contract No. 10, Refuse Destructor Plant," must be delivered to the undersigned not later than midday March 20th.

The Corporation do not bind themselves to accept the lowest or any Tender.

C. MACCULLOCH, Town Clerk.

Municipal Buildings, Greenock,
February 27th, 1906.

CORPORATION OF GREENOCK.

The Corporation are prepared to receive TENDERS for the SUPPLY AND DELIVERY of—

TWO D.C. STEAM GENERATORS OF 750 KW. EACH.
ONE 500 KW. D.C. MOTOR GENERATOR.

Specification and Form of Tender may be obtained from the Burgh Electrical Engineer, at the Municipal Buildings, Greenock, on payment of a deposit of Two Guineas, which will be returned on receipt of a *bona fide* Tender by the date mentioned below.

Extra copies of Specification may be obtained on payment of 5s. each, which will not be returned.

Tenders, addressed to the undersigned, and endorsed "Contract No. 20, Steam Generators, &c.," must be delivered to the undersigned not later than midday, March 15th, 1906.

The Corporation do not bind themselves to accept the lowest or any Tender.

C. MACCULLOCH, Town Clerk.

Municipal Buildings, Greenock,
February 27th, 1906.

LEYTON URBAN DISTRICT COUNCIL

STEAM AND EXHAUST PIPES, &c. FOR ELECTRICITY GENERATING STATION.

The Leyton Urban District Council is prepared to receive TENDERS for STEAM AND EXHAUST PIPES, &c., for its Electricity Generating Station.

A Specification, with Schedules and Form of Tender, can be obtained by the deposit of Two Guineas, from the undersigned at the Electric Light and Power Works, Cathlam Road, Leytonstone, where the plans can be inspected by tenderers between 10 a.m. and 4 p.m., and between 10 a.m. and noon on Saturdays.

Tenders, on the forms attached to the Specifications, are to be delivered to the meeting of the Electric Lighting Committee, to be held at the Town Hall, Leyton, on Thursday, March 15th, 1906, at 7.30 p.m.

Duplicate copies of the Specification can be obtained by the deposit of One Guinea each.

Deposits are returnable one month after the receipt of a *bona fide* Tender, and return of Specifications in respect of which deposits have been made.

The Council does not bind itself to accept the lowest or any Tender.

F. HARMAN LEWIS,

Electrical Engineer to the Council.

The Electric Light and Power Works,
Cathlam Road, Leytonstone,

February 27th, 1906.

APPOINTMENTS OPEN.

INDIAN PUBLIC WORKS DEPARTMENT.

The Secretary of State for India in Council will, in the Summer of 1906, make not less than TEN APPOINTMENTS of ASSISTANT ENGINEER in the Permanent Establishment of the Indian Public Works Department, in addition to the appointments to be made from Cooper's Hill College.

The age of Candidates must not be less than 21, or more than 24 years on the 1st July, 1906.

A printed Form of Application, together with information regarding the conditions of the appointments and certain requirements laid down as to education and experience in engineering, may be obtained from the Secretary, Public Department, India Office, Whitehall, London, S.W.

The Form of Application is to be returned so as to reach him not later than Tuesday, 1st May next.

A. GODLEY,
Under Secretary of State.

India Office, December 10th, 1905.

CIVIL SERVICE COMMISSION.

FORTHCOMING EXAMINATION.

ASSISTANT EXAMINERS IN THE PATENT OFFICE (20-25),
April 5th.

The date specified is the latest at which applications can be received. They must be made on forms to be obtained, with full particulars, from the Secretary, Civil Service Commission, Burlington Gardens, London, W.

EAST INDIAN RAILWAY.—JUNIOR ENGINEER.

The Directors of the East Indian Railway Company are prepared to receive APPLICATIONS (by letter only) from duly qualified candidates, for a TEMPORARY APPOINTMENT as JUNIOR ENGINEER.

Candidates must not be less than twenty-five years' of age, must have received a sound scientific education at some recognised engineering college, and must, in addition, have had at least a year's practical experience on railway or bridge work.

Terms: A three years' agreement, with first-class free passage to India.

Salary: Rupees 450 to Rupees 600 per calendar month, according to qualifications.

The selected Candidate will be required to pass a medical examination by the Company's Consulting Physician before appointment.

Letters of application, accompanied by a brief record in chronological order of the Candidate's career, with dates, together with copies (not originals) of testimonials, and a medical certificate of fitness for residence in India (which will not be returned), should be addressed to the undersigned not later than Monday, March 15th, 1906.

By order,

C. W. YOUNG, Secretary.

East Indian Railway Company,
28-30, Nicholas Lane, London, E.C.,
February 20th, 1906.

WALTHAMSTOW URBAN DISTRICT COUNCIL.

ELECTRICAL AND MECHANICAL ENGINEER. TRAFFIC MANAGER.

The Council invite APPLICATIONS for the post of ELECTRICAL and MECHANICAL ENGINEER, to be responsible for the Electric Light Undertaking and the whole of the Electrical Equipment in connection with the Power Station and the Tramways system, at a salary of £450 per annum, rising by annual increments of £25 to £450. The Council also requires the services of a TRAFFIC MANAGER, to be responsible for the working of the tramways at a salary of £200 per annum, rising by annual increments of £20 to £200.

Candidates must have had previous experience in similar positions. Applications in writing, marked "Electrical and Mechanical Engineer," or "Traffic Manager" respectively, stating age, qualifications and experience, accompanied by copies of not less than three testimonials of recent date, must reach the undersigned by 5 o'clock p.m. on Tuesday, the 13th day of March, 1906.

C. SYDNEY WATSON,

Clerk to the Council.

Town Hall, Walthamstow,
March 1st, 1906.

THREE ENGINEERING EXHIBITIONS.

Value £40, £50, and £60, will be OFFERED for COMPETITION on MARCH 13th. Candidates, who must be under 17, will be required to take Mathematics, English, one Modern Language, and may take Science. Apply, Secretary, Grammar School, Bedford.

Buyers' Directory.

NOTE.—The display advertisements of the firms mentioned under each heading can be found readily by reference to Alphabetical Index to Advertisers on pages 22 and 24.

In order to assure fair treatment to advertisers, each firm is indexed under its leading speciality ONLY.

Advertisers who prefer, however, to be entered under two or more different sections can do so by an annual payment of 5s. for each additional section.

Advertisers' Service Bureau.

British Advertiser Service Bureau, Queen Anne's Chambers, Westminster, S.W.

Artesian Well Machinery.

John Z. Thom, Patricroft, Manchester.

Band Sawing Machines.

Noble & Lund, Ltd., Felling-on-Tyne.

Bearings (Roller).

Hyatt Roller Bearing Co., 47, Victoria Street, London, S.W.

Belting.

Birney & Son, Catherine Street, City Road, London, E.C.
Cort, Arthur, & Co., Camberwell, London, S.E.
Fleming, Birby & Goodall, Ltd., West Grove, Halifax.
Gilmour, W. & O., St. John's Hill, Edinburgh.

Boilers.

Clayton, Son & Co., Ltd., Leeds City Boiler Works, Leeds.
Hartley & Sugden, Ltd., Halifax.
Thompson, John, Wolverhampton.

Boilers (Water-tube).

Babcock & Wilcox, Ltd., Oriol House, Farringdon Street, London, E.C.
Stirling Boiler Co., Ltd., Motherwell, N.B.

Bolts, Nuts, Rivets, etc.

Rayless, Jones & Bayliss, Ltd., Monmore Green, Wolverhampton.
Herbert W. Feriam, Ltd., Floodgate Street Works, Birmingham.
T. D. Robinson & Co., Ltd., Derby.

Books.

Griffin, Charles, & Co., Exeter Street, Strand, W.C.
New Zealand Mines Record, Wellington, New Zealand.
Spon, E. & F. N., 125, Strand, W.C.

Boring Machines.

Asquith, William, Ltd., Well Road Works, Halifax.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Noble & Lund, Ltd., Felling-on-Tyne.
Swift, George, Clarence Ironworks, Halifax.

Cables.

Calender's Cable and Construction Co., Ltd.

Case-Hardening Compounds.

Hy. Miller & Co., Milgarth Works, Leeds.

Castings.

Asmorse, Benson, Pease & Co., Ltd., Stockton-on-Tees.

Catalogues, Printing, &c.

Atlantic Press, Ltd., Weymouth Street, Manchester.
Spotiswoode Advertising Agency, Clun House, Surrey Street, Strand, W.C.
Staithford, Arthur, & Co., Denton, Manchester.

Chucks.

Fairbanks Co., 78-80, City Road, London, E.C.

Cisterns, Tanks, &c.

Asmorse, Benson, Pease & Co., Ltd., Stockton-on-Tees.
Clayton, Son & Co., Ltd., Hunslet, Leeds.
F. A. Keep, Juxon & Co., Barn Street, Birmingham.

Clutches (Friction).

David Bridge & Co., Castleton Ironworks, Rochdale, Lancashire.

Condensing Plant.

Benn, Sykes, Haslingden, near Manchester.
Concentric Condenser, Ltd., 23, Northumberland Avenue, London, W.C.
Mirrieles-Watson & Co., Ltd., Glasgow.

Consulting Engineers.

Gibbs, John, & Son, 80, Juke Street, Liverpool.
G. H. Hughes, A.M.I.E.E., 19, Old Queen Street, Westminster, S.W.
Melville & Macalpine, 615, Walnut Street, Philadelphia, Pa., U.S.A.
Mount-Haes, A., M.I.Mech.E., 11, Ironmonger Lane, London, E.C.

Continental Railway Arrangements.

Northern Railway of France.
South Eastern & Chatham Railway Co.

Conveying and Elevating Machinery.

Adolf Bleichert & Co., Leipzig-Gohlis, Germany.
Temperley Transporter Co., 72, Bishopsgate Street Within, London, E.C.

Copper and Brass.

W. Hepton & Son, Hunslet Lane, Leeds.

Coverings (Boiler).

Magnesia Covering, Ltd., Washington Station, co. Durham.

Cranes, Travellers, Winches, etc.

Joseph Booth & Bros., Ltd., Rodley, Leeds.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.

Cranks.

Clarke's Crank & Forge Co., Ltd., Lincoln, England.

Cutters (Milling).

Coventry Ordnance Works, Ltd., Coventry.
Pratt & Whitney Co., 23-25, Victoria Street, London, S.W.
E. G. Wrigley & Co., Ltd., Foundry Lane Works, Soto, Birmingham.

Destructors.

Heenan & Froude, 4, Chapel Walks, Manchester.
Horsfall Destructor Co., Ltd., Armley, Leeds.

Dredges and Excavators.

Delange & Cie, Meca, Hoboken, near Antwerp.
Rose, Downs & Thompson, Ltd., Old Foundry, Hull.

Drilling Machines.

Asquith, William, Ltd., Well Road Works, Halifax.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Noble & Lund, Ltd., Felling-on-Tyne.
Swift, George, Clarence Ironworks, Halifax.

Economisers.

E. Green & Son, Ltd., Manchester.

Ejectors (Pneumatic).

Hughes & Lancaster, 16, Victoria Street, London, S.W.

Electrical Apparatus.

Allgemeine Elektricitäts Gesellschaft, Berlin, Germany.
British Westinghouse Electric and Manufacturing Co., Ltd., Norfolk Street, Strand, London, W.C.
Broadbent, T. W., Victoria Electrical Works, Huddersfield.
Crypto Electrical Co., 3, Tyer's Gateway, Bermondsey, Street, London, S.E.
Ebonextos Manufacturing Co., 22, Rosoman Street, London, E.C.
Gent & Co., Ltd., Faraday Works, Leicester.
Greenwood & Bailey, Ltd., Albion Works, Leeds.
India Rubber, Gupta Percha, and Telegraph Works Co., Ltd., Silvertown, London, E.
Johnson and Phillips, Ltd., Victoria Works, Old Charlton, Kent.
Matthews & Yates, Ltd., Swinton, Manchester.
Mix and Genest, Berlin, W. Germany.
Nalder Bros. & Thompson, 34, Queen Street, London, E.C.
New Gutta Percha Co., Ltd., Dashedwood House, New Broad Street, E.C.
Newton Brothers, Full Street, Derby.
Phoenix Dynamo Manufacturing Co., Bradford, Yorks.
Scott, E., & Mountain, Ltd., Newcastle-on-Tyne.
Turner, Atherton & Co., Ltd., Denton, Manchester.
B. Weaver & Co. (see Ebonextos Manufacturing Co.), 22, Rosoman Street, Clerkenwell, London, E.C.

Engineers' Supplies.

Ahters, Ad., Whitley Bay, near Newcastle-on-Tyne.

Engines (Gas).

Campbell Gas Engine Co., Ltd., Halifax.
Cundall, S. & Co., Ltd., Airedale Iron Works, Shipley.

Engines (Electric Lighting).

McLaren, J. and H., Midland Engine Works, Leeds.

Engines (Locomotive).

Baldwin Locomotive Works, Philadelphia, Pa., U.S.A.
Hunslet Engine Co., Ltd., Leeds, England.
Hudswell, Clarke & Co., Ltd., Leeds, England.
McLaren, J. & H., Midland Engine Works, Leeds.

Engines (Oil).

Brown & May, Ltd., Devizes.

Engines (Stationary).

Mirrieles Watson Co., Ltd., Glasgow.

Engines (Traction).

Jno. Fowler & Co. (Leeds) Ltd., Steam Plough Works, Leeds.

Engravers.

Jno. Swain & Son, Ltd., 58, Farringdon Street, London, E.C.

Exhaust Steam Oil Separators.

Lancaster & Tonge, Ltd., Pendleton, Manchester.

Fans, Blowers.

Cape Fan Co., 13, Moseley Street, Newcastle-on-Tyne.
Davidson & Co., Ltd., "Sirocco" Engineering Works, Belfast, Ireland.
Gibbs, John & Son, 80, Juke Street, Liverpool.
Matthews & Yates, Ltd., Swinton, Manchester.

Fencing and Gates (Iron).

Bayliss, Jones & Bayliss, Ltd., Monmore Green, Wolverhampton.

Files.

Flicker, Templin & Co., Ltd., Newhall Steel Works, Sheffield.

Fire Bricks.

J. H. Sankey & Son, Ltd., Essex Wharf, Canning Town, London, E.

Firewood Machinery.

A. Glover & Co., Patentees and Saw Mill Engineers, Leeds.
Hill and Herbert, Ltd., Great Central Street, Leicester.

PAGE'S WEEKLY

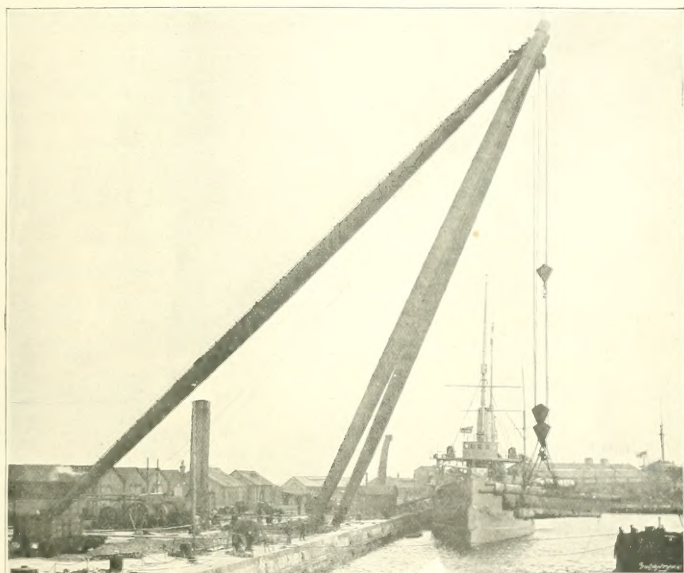
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Tel No. 2110 Avenue.

Works:
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Buyers' Directory—(Continued).

Fountain Pens.

Mabie, Todd & Bard, 93, Cheapside, London, E.C.

Forging (Drop) Plants.

Brett's Patent Lifter Co., Ltd., Coventry.

Forgings (Drop).

J. H. Williams & Co., Brooklyn, New York, U.S.A.

Furnaces.

Deighton's Patent Flue & Tube Company, Vulcan Works, Pepper Road, Leeds.
Leeds Forge Co., Ltd., Leeds.

Gauge Glasses.

J. B. Treasure & Co., Vauxhall Road, Liverpool.
Tomey, J., & Sons, Aston, Birmingham.

Gauges (Pressure, Vacuum, and Hydraulic).

Lobbie, McInnes, Ltd., 45, Bothwell Street, Glasgow.

Gearing.

Ahlers, Ad., Whitley Bay, near Newcastle-on-Tyne.
Angus, G. & Co., Ltd., Newcastle-on-Tyne.
Asquith, William, Ltd., Well Road Works, Halifax.
Dixon, W. F., & Co., 60, Percival Street, C. on-M., Manchester.
Reid Gear Co., Linwood, near Glasgow.
Wild, M. B., & Co., Argyle Street, Nethells, Birmingham.

Greases.

Blumann and Stern, Ltd., Plough Bridge, Deptford, London, S.E.

Hack Saws.

Baynes, Charles, Knuzden Brook, Blackburn.

Hammers (Steam).

Davis & Primrose, 1, Leith Ironworks, Edinburgh.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.

Hoisting Machinery.

See Conveying Machinery.

Horizontal Boring Machines.

Asquith, William, Ltd., Well Road Works, Halifax.
Greenwood & Batley, Albion Works, Leeds.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Noble & Lund, Ltd., Felling-on-Tyne.
Swift, George, Clarence Ironworks, Halifax.

Hydraulic Leather.

Ahlers, Ad., Whitley Bay, near Newcastle-on-Tyne.

Hydraulic Machine Tools.

Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Vauxhall and West Hydraulic Engineering Co., Ltd., 23, College Hill, London, E.C.

Ice-making and Refrigerating Machinery.

H. J. West & Co., 114-118, Southwark Bridge Road, London, S.E.

Indicators.

Dobbie McInnes, Ltd., 45, Bothwell Street, Glasgow.
Hannan & Buchanan, 75, Robertson Street, Glasgow.

Iron and Steel.

Allen, Edgar, & Co., Ltd., Imperial Steel Works, Sheffield.
Asham Bros. & Wilson, Ltd., Sheffield.
Buckley, Saml., St. Paul's Square, Birmingham.
Fairley & Sons, James, Old Mint, Shadwell Street, Birmingham.
Farnley Iron Co., Ltd., Leeds, England.
Flockton, Tomplin & Co., Ltd., Newhall Steel Works, Sheffield.
Fried. Krupp, Grusonwerk, Magdeburg-Buckau, Germany.
J. Frederick Melling, 14, Park Row, Leeds, England.
Farker Foundry Co., Derby.
Furden, John & Sons, Lambhill Forge, by Maryhill, Glasgow.
Walter Scott, Ltd., Leeds Steel Works, Leeds, England.

Ironwork (Constructional).

F. A. Keep, Juxon & Co., Barn Street, Birmingham.

Ironwork (Galvanised).

F. A. Keep, Juxon & Co., Barn Street, Birmingham.

Lathes.

Asquith, William, Ltd., Well Road Works, Halifax.
Bradbury & Co., Ltd., Wellington Works, Oldham.
Eclipse Tool Manufacturing Co., Linwood, near Glasgow.
Lackenby, Benton, & Co., Perseverance Ironworks, Halifax.
Mitchell, D., & Co., Ltd., Parsonage Works, Reigh ey.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Noble & Lund, Ltd., Felling-on-Tyne.
Northern Engineering Co. (1900), Ltd., King Cross, near Halifax.
Swift, George, Clarence Ironworks, Halifax.

Lathe Carriers

Williams, J. H., & Co., Brooklyn, New York, U.S.A.

Laundry Machinery.

Hill and Herbert, Ltd., Great Central Street, Leicester.
Summerscales, W. & Sons, Ltd., Engineers, Phoenix Foundry, Keighley, England.

Lifts.

Waygood & Co., Ltd., Falmouth Road, London, S.E.

Lubricants.

Blumann and Stern, Ltd., Plough Bridge, Deptford, London, S.E.
Reliance Lubricating Oil Co., The, 19 & 20, Water Lane, Great Tower Street, London, E.C.

Machine Tools.

Asquith, William, Ltd., Well Road Works, Halifax.
George Addy & Co., Waverley Works, Sheffield.
Bateman's Machine Tool Co., Hunslet, Leeds.
Beanland, Perkin, & Co., School Close Works, Leeds.
Bertrams, Ltd., St. Katherine's Works, Sciennes, Edinburgh.
Bradbury & Co., Ltd., Wellington Works, Oldham.
Breuer, Schumacher & Co., Ltd., Kalk, near Cologne-on-Rhine (Germany).
Consolidated Pneumatic Tool Co., Ltd., Palace Chambers, 9, Bridge Street, Westminster, S.W.
Cunliffe & Croom, Ltd., Broughton Ironworks, Manchester.
Dean, Smith & Grace, Ltd., Keighley.
Dempster, Moore & Co., Ltd., 49, Robertson Street, Glasgow.
Fengli, A., & Co., Grafton Street, Altrincham.
Greenwood & Batley, Ltd., Leeds.
Jones & Lamson Machine Co., 17, Queen Victoria Street, London, E.C.
John Lang & Sons, Johnstone, near Glasgow.
Luke & Spencer, Ltd., Broadbent, Manchester.
Jos. C. Nicholson Tool Co., City Rd. Tool Wks., Newcastle-on-Tyne.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Noble & Lund, Ltd., Felling-on-Tyne.
Northern Engineering Co., 1900, Ltd., King Cross, near Halifax.
J. Parkinson & Son, Canal Ironworks, Shipley, Yorkshire.
C. Redman & Sons, Halifax.
Resides, 12, Aire Street, Brighouse, Yorks.
Rice & Co. (Leeds), Ltd., Leeds, England.
G. F. Smith, Ltd., South Parade, Halifax.
Swift, George, Clarence Ironworks, Halifax.
Taylor and Chalken, Ltd., Derwent Foundry, Constitution Hill, Birmingham.
Vauxhall and West Hydraulic Engineering Co., Ltd., 23, College Hill, London, E.C.
H. W. Ward & Co., Lionel Street, Birmingham.
T. W. Ward, Albion Works, Sheffield.
West Hydraulic Engineering Co. (see Vauxhall and West Hydraulic Engineering Co. Ltd.), 23, College Hill, London, E.C.
Winn, Charles & Co., St. Thomas Works, Birmingham.
Yorkshire Machine Tool and Engineering Works, Liversedge, Yorks.

Machinery Merchants.

Greenwood, Thomas, Waterside, Halifax.

Marks.

Prior, Edward, & Son, 68, West Street, Sheffield.

Metals.

Delta Metal Co., Ltd., East Greenwich, London, S.E.
Magnolia Anti-Friction Metal Co., Ltd., of Great Britain, 49, Queen Victoria Street, London, E.C.
Phosphor Bronze Co., Ltd., Southwark, London, S.E.

Metals (Perforated).

Brown, Andrew, & Co., 110, Cannon Street, London, E.C.
Meguin, Fr., & Co., Ltd., Engineering Works, Dillingen-on-Saar.
Stanier, John, & Co., Manchester Wire Works, Manchester.

Mining Drill Steel.

Flockton, Tomplin, & Co., Ltd., Newhall Steel Works, Sheffield.

Office Appliances.

Davis, J. H., & Son, Ltd., 30, All Saints' Works, Derby.
Halden & Co., J. & B. Albert Square, Manchester.
Hall & Co., E. J., 39, Victoria Street, London, S.W.
Inglesant, T., & Sons, Ltd., Atlas House, Leicester.
Lyle Co., Ltd., Harrison Street, Gray's Inn Road, London, W.C.
Rockwell-Wabash Co., Ltd., 69, Milton Street, London, E.C.
Shannon, Ltd., Ropemaker Street, London, E.C.
Trading and Manufacturing Co., Ltd., Temple Bar House, Fleet Street, London, E.C.

Oils, &c.

Blumann and Stern, Ltd., Plough Bridge, Deptford, London, S.E.

Oil Filters and Cabinets.

Vitor Co., Ltd., Rocky Lane, Aston Cross, Birmingham.

Packing.

Eldam Packing & Rubber Co., 93-94, Gracechurch Street, London, E.C.
Lancaster & Tongue, Ltd., Pendleton, Manchester.
Redfern & Co., S. Swan Lane, New Brown Street, Manchester.
Quaker City Rubber Co., Coronation House, Lloyd's Avenue, E.C.
United States Metallic Packing Co., Ltd., Bradford.

Paper.

Lepard & Smiths, Ltd., 29, King Street, Covent Garden, London, W.

Patent Agent.

Lorrain, J. G., M.I.E.E., M.I.Mech.E., Norfolk House, Norfolk Street, Strand, London, W.C.



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Horizontal Flame Unaffected by Weather
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OIL GAS LAMP NO 50**

**WELLS' OIL GAS
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Weight, 10 lb. Capacity, 7 pints.
Burning about 7 hours.

Made in Sheet Steel and top and bottom of our "Unbreakable" Metal, for Lightness and Strength, with large Capacity.

Price, with Single Burner..	16/- each
.. Double	19
Tripod Stands	3/-
Extra Burners	2/-

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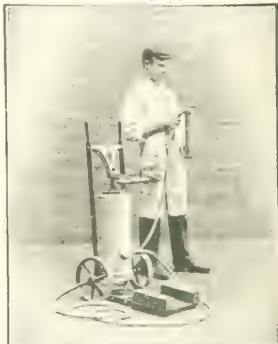
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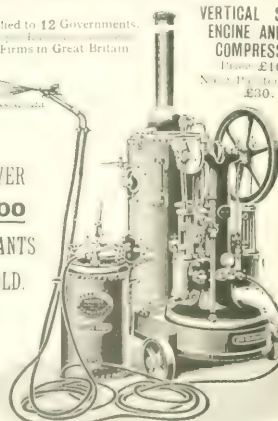
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**VERTICAL STEAM
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Price £100.
No. 1 1/2 hp. for extra £30.

OVER
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PLANTS
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Buyers' Directory—(Continued).**Photo Copying Frames.**

J. Halden & Co., 8, Albert Square, Manchester.
B. J. Hall & Co., 39, Victoria Street, London, S.W.

Photographic Apparatus.

Mason & Co., 134, 132 and 13, South Square, London, W.

Pinch Bars.

Samson & Co., Garforth, near Leeds.

Pipe Wrenches (Chain).

Williams, J. H., & Co., Brooklyn, New York, U.S.A.

Pistons.

Lancaster & Tonge, Ltd., Pendleton, Manchester.

Planished Sheets.

Zeitz & Co., 21, Lime Street, London, E.C.

Pneumatic Tools.

Consolidated Pneumatic Tool Co., Ltd., Palace Chambers,
6, Bridge Street, Westminster, S.W.

Porcelain.

Gustav Richter, Charlottenburg, near Berlin, Germany.

Presses (Hydraulic).

Greenwood & Batley, Albion Works, Leeds.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.

Publishers.

Charles Griffin & Co., Ltd., Exeter Street, Strand, London, W.C.
Spou, E. and F. N., 125, Strand, W.C.
New Zealand Mines Record, Wellington, New Zealand.

Pulley Blocks.

Kramos Ltd., Locksbrook Engineering Works, Bath.

Pumps and Pumping Machinery.

Drum Engineering Co., 33, Brook Street, Bradford.
Enke, Carl, Schleuditz-Leipzig, Germany.
Fraser & Chalmers, Ltd., 3, London Wall Buildings, London, E.C.
J. P. Hall & Sons, Ltd., Peterborough.
Hathorn, Davey & Co., Ltd., Leeds, England.
Positive Rotary Pumps, Ltd., 23, Northumberland Avenue, London, W.C.

Radial Drilling Machines.

Asquith, William, Ltd., Well Road Works, Halifax.
Greenwood & Batley, Albion Works, Leeds.
Mitchell, D., & Co. Ltd., Parsonage Works, Keighley.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Noble & Lund, Ltd., Felling-on-Tyne.
Northern Engineering Co. (1900), Ltd., King Cross, near Halifax.
Swift, George, Clarence Ironworks, Halifax.

Rails.

Wm. Firth, Ltd., Leeds.

Railway and Tramway Fastenings.

Bates, James & Bates, Ltd., Moor Green, Wolverhampton.

Riveted Work.

P. A. Keep, Juxon & Co., Forward Works, Barn Street, Birmingham.

Roller Bearings.

Hyatt Roller Bearing Co., 47, Victoria Street, London, S.W.

Roofs.

D. Anderson & Son, Ltd., Lagan Felt Works, Belfast.
Clayton, Son & Co., Ltd., Hunslet, Leeds.
Head, Wrightson & Co., Ltd., Thornaby-on-Tees.
McTear & Co., Ltd., Newtownards Road, Belfast.
Mellows & Co., Ltd., Sheffield.

Ropeways (Aerial).

Bullivant & Co., Ltd., 72, Mark Lane, London, E.C.
Pohlitz, J., Ltd., Cologne, Germany.

Scientific Instruments.

Cambridge Scientific Instrument Co., Ltd., Cambridge.

Shearing and Punching Machines.

Essel, R. & Co., 11, City Road, London, E.C.

Slotting Machines.

Noble & Lund, Ltd., Felling-on-Tyne.
Swift, George, Clarence Ironworks, Halifax.

Spanners.

Wulams, J. H., & Co., Brooklyn, New York, U.S.A.

Stampings.

Thomas Smith & Sons of Salford, Ltd., Birmingham.
Wulams, J. H., & Co., Brooklyn, New York, U.S.A.

Stamps (Rubber).

Rubber Stamp Co., 1 & 2, Holborn Buildings, Broad Street Corner, Birmingham.

Stamps (Metal).

Edward Pryor & Son, 68, West Street, Sheffield.

Steam Traps.

Lancaster & Tonge, Ltd., Pendleton, Manchester.

Steam Wagons.

Thornycroft & Co., Ltd., J. I., Chiswick, London, W.
Yorkshire Patent Steam Wagon Co., Pepper Road, Hunslet, Leeds.

Steel Structures.

Ashmore, Benson, Pease & Co., Ltd., Stockton-on-Tees.
Clayton, Son & Co., Ltd., Hunslet, Leeds.

Steel Tools.

Buckley, Saml., St. Paul's Square, Birmingham.
Pratt & Whitney Co., 23-25, Victoria Street, London, S.W.

Steel (Tool Steel).

Buckley, Saml., St. Pauls Square, Birmingham.
Flockton, Tompkin & Co., Ltd., Newhall Steel Works, Sheffield.

Stokers.

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S. Howes Co., 64, Mark Lane, London, E.C.

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Yost Typewriter Co., 50, Holborn Viaduct, London, E.C.

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Hunt & Milton, Crown Brass Works, Oozells Street North,
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Shaw, Joseph, Albert Works, Huddersfield.
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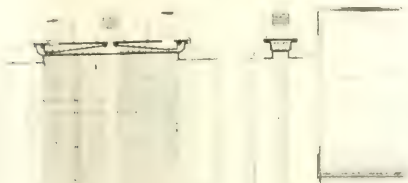
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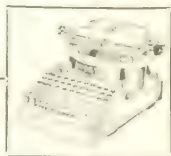
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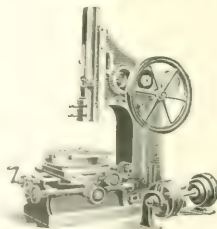
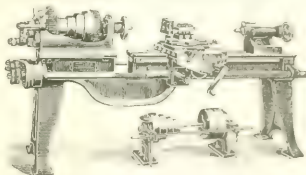
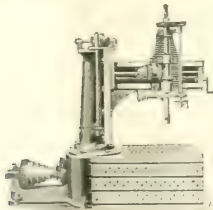
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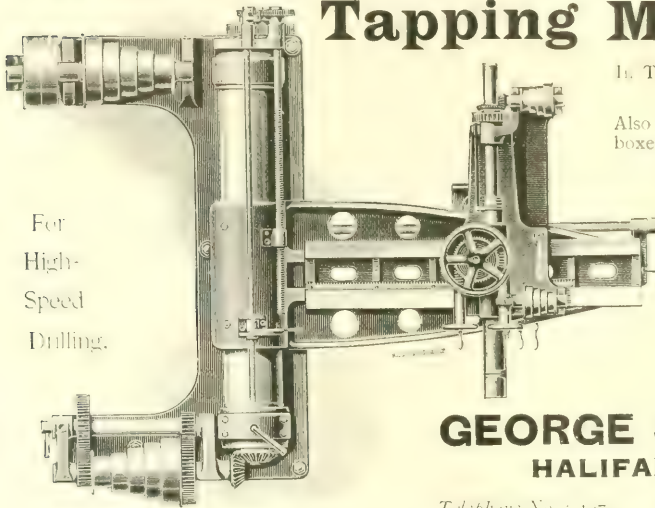


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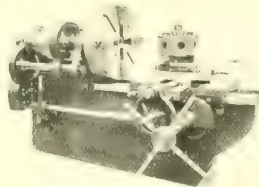
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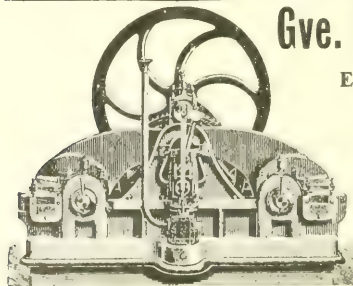
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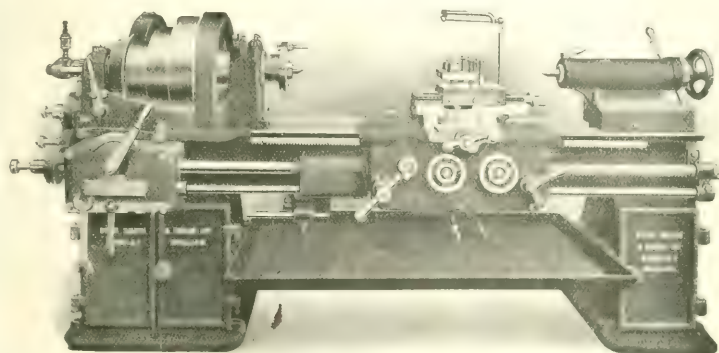
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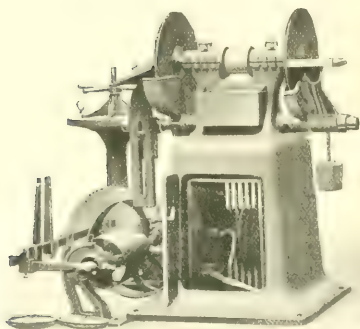


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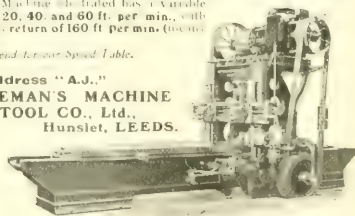
Vauxhall Road, Liverpool.

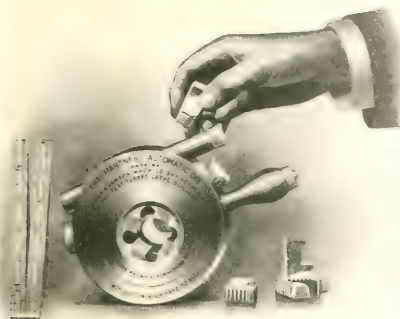
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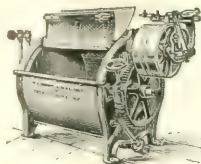
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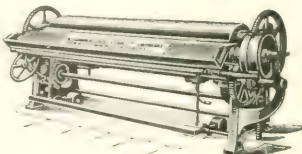
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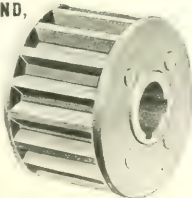
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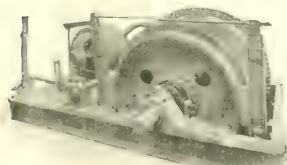
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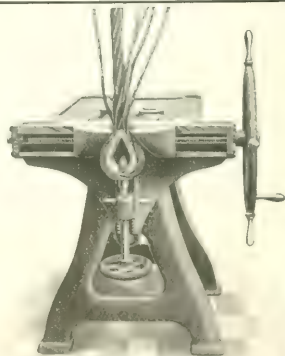
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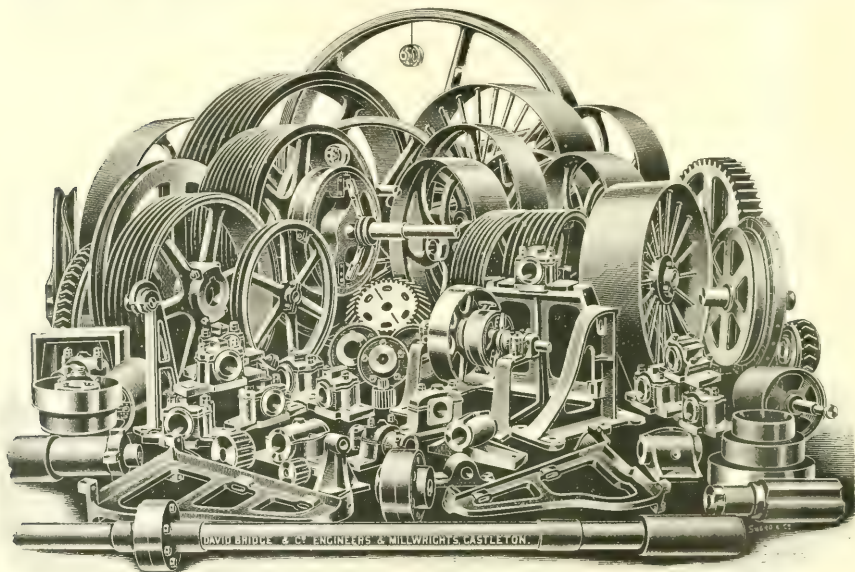
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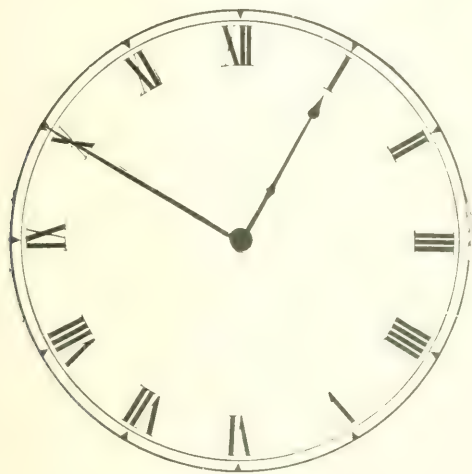
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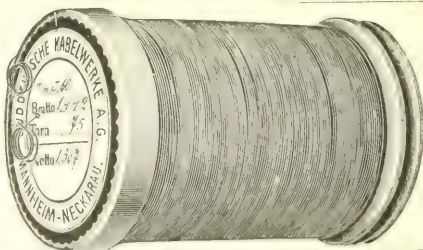
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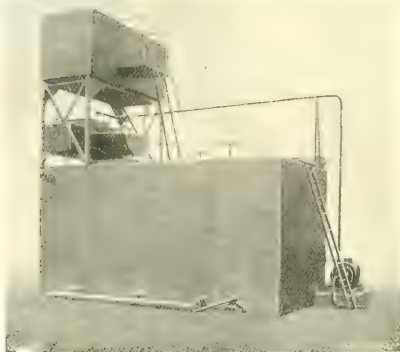
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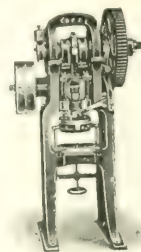
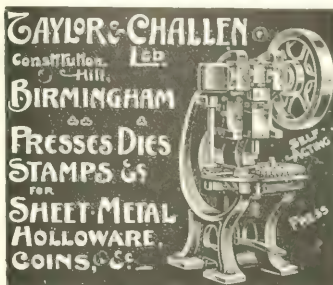
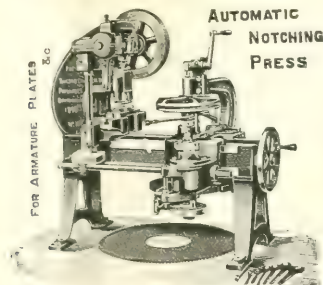


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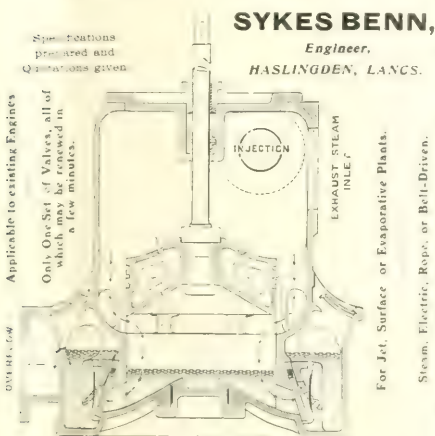
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VOL. VIII.

LONDON, FRIDAY, MARCH 9, 1906.

No. 78.

THE OFFICES OF "PAGE'S WEEKLY,"

Wednesday evening.

"DO we work hard enough?" is the question which is virtually raised by Dr. Gray in his review of the engineering industry, dealt with in this issue. There is evidence that the view taken is based upon matters largely historical, and it is necessarily somewhat narrow, but the Commissioner does not hesitate to tell us that working men in this country are not working so hard as they can, and that the industry is consequently very much below its highest possible efficiency. In view of the ever-increasing pressure of foreign competition, we have here, surely, an indictment that is worthy of most careful consideration. Dr. Gray sees us through American spectacles, and he is not called upon to suggest a remedy. He, however, directs attention to some of the conditions which are responsible for the alleged deficiency of output, and his criticisms are certainly worth attention.

There is possibly something more than coincidence in the fact that the very next volume to come under our notice offers emphatic evidence of the need of more strenuous application. The work we refer to—"Industrial Efficiency," by Dr. Arthur Shadwell, M.A.—is in many respects remarkable. The author has gone through England, the United States, and Germany, and has noted with seeing eyes and a facile pen the various factors that in each case are making for industrial efficiency. In an equally impartial manner he etches in our blemishes and those of our chief competitors, without once suggesting—and for this we are grateful—that Great Britain should take lessons in foreign schools. We think there

is much in these entertaining volumes which every employer and every workman may read with profit, but it is particularly interesting to us at the moment because of its bearing upon the point raised in the American official report already referred to.

The Germans he characterises as slow, deliberate, careful, methodical, and thorough. The Americans are alert, inventive, ingenious, and adventurous



DR. ARTHUR SHADWELL, M.A.,
Author of "Industrial Efficiency."

beyond all other people, but hurried, careless, and unthorough. Many instances of this are cited, the author laying particular stress upon the amount of time which is wasted in the States in saving trouble. It is surely remarkable, he says, that so little first-class work of any kind is produced in the United States, with all its wealth, population, and educational keenness. "Let it go at that," seems to be written all over the face of the land. You see it in wretchedly laid railway and tramway tracks, in swaying telegraph poles, and sagging wires, in sliding embankments and rotten trestle bridges, in level crossings, in dingy and battered street letter-boxes, in broken fences, in streets unscavenged, unpaved or full of deep holes, in broken-down vehicles with rickety wheels too slight for their work, and harness tied up with string, in rubbishy cutlery and a hundred such articles, in scamped and hurried work everywhere. There seems to be a disdain or impatience of thorough workmanship and finish in detail. The same national failing is conspicuous in the factory and workshop.

To the English Dr. Shadwell assigns a middle place. "They are less—very much less—methodical than the Germans; less alert and enterprising than the Americans. In regard to national qualities, the English are, perhaps, rather better equipped by nature for industrial success than either of their chief competitors. Wherein they fail is in the application of their powers, which have been to a great extent allowed to fall into disuse, while the others have gone on ahead each in her own way." It is in the second volume that we find strongest confirmation of the theory that we do not work hard enough. The author states emphatically that "the prevailing, though not universal, spirit at home is that of getting as much and doing as little as possible." He by no means condemns the shorter hours worked in England, being of opinion that, on the whole, they make for efficiency and are of advantage, provided that the time is fully and faithfully utilised by strenuous application. If it is not, then they are a handicap on English industry, which stands to be beaten in quantity by the more prolonged labour of both competitors. How to secure that quantity is the problem

for this country; how to shorten hours without loss is the problem for Germany; and how to improve quality without sacrificing output is the problem for America.

In his concluding chapter the author says: "I am convinced from what I have seen in the three countries—and I submit with all humility that no one has attempted a comparative study either so close or so comprehensive—that tariffs alone, although they be raised as high as Haman's gallows, could not do for Germany and America what they have done by other means. I sum them up under the word 'work,' because it covers them all, and no other does. The methods are so entirely different that they only have this common quality; and here lies the value of the double comparison. It enables us to see that the essential thing is not this or that, as we have so often been told, but just work, which finds expression in different forms, according to national circumstances and character. The British people have been deluged of late years with exhortations to find salvation in copying some particular procedure or institution which happens to have impressed an observer in some other country. The advice may be good, but probably it is not, for the particular thing recommended has been adapted to conditions which certainly differ in some degree, and may differ very widely indeed. The real thing to copy is the spirit which has issued in that procedure or institution, and without which it is useless." We are relieved to find that the author views the future in this matter with entire equanimity. The cause of this national condition which is producing so much searching of heart in one manifestation with another is nothing but "over-prosperity, which has always produced the same results in every nation which has suffered from it." Dr. Shadwell is satisfied that we have not lost the energy we had. We still have more physical energy than any of our rivals, and he thinks we may rely on the steady pressure of economic conditions to correct a functional disorder brought on by repletion in a still fairly healthy body, not as yet advanced to an organic disease.*

* "Industrial Efficiency. By Arthur Shadwell, M.A., M.D. Two vols. Longmans. 208 net.

Science and the Industries.

In a letter to *The Times*, dealing with "Science and the Industries," Professor Silvanus Thompson says:—

The two industrial groups in Germany, which, with their capital of £5,000,000, pay dividends of from 20 to 30 per cent. per annum, in the production of coal-tar products, are an object lesson if England is to wake up to the perilous results of the neglect of scientific research. It may be too late to dream of attempting to recover for this country the lost colour industry: but it is not too late to learn how to save from a like fate two other groups of industries which no less depend upon the adequate cultivation of scientific research. I refer to the electrical industry, and to that of the manufacture of steel. With the latter I will leave more competent hands to deal, merely remarking that if the steel industry is not to pass, like the colour industries, into other countries, we must do much more than endow a metallurgical department in the University of Sheffield or reconstruct our Royal School of Mines. We have got to staff our steel works with men scientifically trained, and to keep the torch of research burning brightly, not in technical schools or institutes alone, but in the inmost heart of the industries themselves. What is really needed is that the commercial and educational leaders of the nation shall open their eyes to the absolutely vital nature of scientific research

in its bearing on industrial prosperity. Even in the scientific departments of the Universities and in the best of the technical colleges the men who might be doing pioneering work are loaded with administrative and educational duties, and the material facilities for research placed at their disposal are not seldom ludicrously inadequate or even non-existent.

Sir Joseph Lawrence, in the course of a long and interesting reply, states that, broadly speaking; the cost of purely scientific research cannot, under present conditions of business, confronted with severe foreign competition, be afforded by manufacturing firms dependent upon profits for their continued existence. These conditions prevent the reaping of those profits and the attainment of that stability without which it is not possible to keep up large and expensive experimental staffs.

Sir Joseph adverts to the work which is being carried on at the National Physical Laboratory, and says it is to these institutions, and not to the "inmost heart of the industries" themselves, that British manufacturers must for some time look for "scientifically trained" men.

The following excerpts are also suggestive:—

"Nor is it quite accurate to assert, or imply, that factories and works connected with some of the industries which Professor Thompson mentions are so wholly neglectful of average scientific and expert aid as

one would infer from his letter. In the iron and steel industry, Consett, Dowlais, and many other great establishments have their laboratories and chemists, and even in connection with distant iron mines owned by Englishmen there are chemists and metallurgists on the spot. The proceedings of the Iron and Steel Institute show that research is continuously active, though necessity compels British firms to especially keep one eye on the commercial conditions. Notwithstanding, in Great Britain new inventions and new processes are being constantly tried, at great outlay in plant, by our great iron and steel firms.

"The enormous strides which Germany and America have made in the last dozen years, as evidenced by the growth of their outputs or production, which severally exceed those of Great Britain, are due, as every tyro knows, to causes commercially more potent than scientific and technical proficiency, such as the cheapness and nearness of ore deposits, control of markets, freights, tariffs, etc."

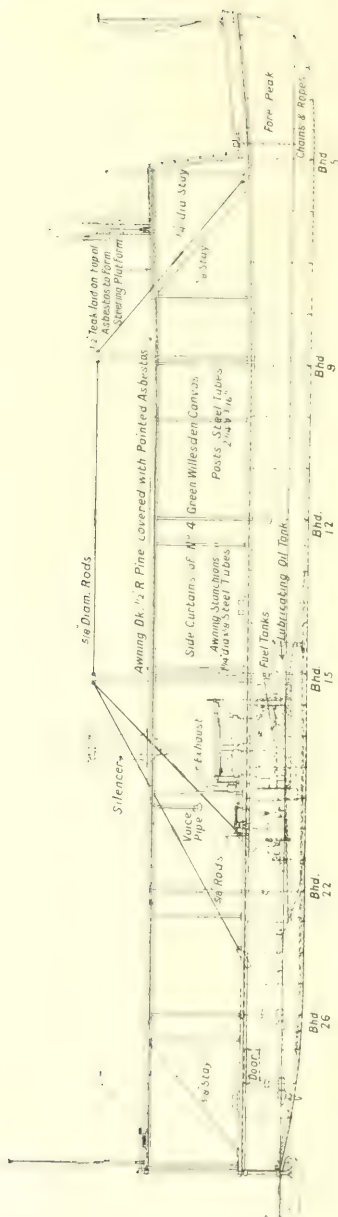
"It is when Professor Thompson comes to the British electrical industry, and says with regard to it that 'for the last six years the British electrical firms have been so busy undercutting one another in prices that they have no means available for maintaining expensive research departments,' that



THE VICTORIA FALLS BRIDGE.

A full-length view of the Victoria Falls Bridge, M. A. H. The above is an artistic photo taken by Miss D. F. Hobson, who accompanied Mr. Thompson on his tour of inspection in Rhodesia and the South African Colonies last year, two or three months in advance of the British Association. Readers of PAGE'S WEEKLY are already familiar with the main facts concerning the bridge, but it is by no means easy to realise that it is 650 ft. long and stands higher above the water than does St. Paul's Cathedral from

(Cont. on p. 1000.)



THE LIGHT DRAUGHT MOTOR LAUNCH "SPIDER."

Constructed by Messrs. John I. Thornycroft and Co., Ltd., for Government Service in Southern Nigeria.

Light Draught Motor Launch *Spider*.

This boat, which we illustrate in the adjoining column, has been built to the order of the Crown Agents for the Colonies, under the superintendence of Sir Edward Reed for service in Southern Nigeria. The launch is built of steel galvanised, and is 56 ft. 3 in. overall, and 9 ft. beam with a draught of 12 in. when carrying a load of four tons. The hull is open, with a short deck over the fore peak, and protected from the tropical sun by a light wood awning, on which is placed the steering wheel forward, and curtains along the sides of green Willesden canvas. The hull is subdivided by six watertight bulkheads, floor boards being fitted along the bottom of the boat forming deck.

To facilitate steering on the light draught three single-plate balanced rudders are provided. There are two propellers on one shaft working in a tunnel, an arrangement found to be the most suitable in this class of vessel.

The engine is a four-cylinder Thornycroft marine motor, having a bore and stroke of 6 in. by 8 in. respectively. The normal number of revolutions is 800, and at this speed the engine develops 40 b.h.p. on paraffin; as, however, the engine is intended to run at a very low number of revolutions, approximately 380, it will not develop more than 25 h.p. The capacity of the fuel tanks is 80 gallons.

On the invitation of Messrs. Thornycroft a representative of this journal was present at a trial trip of the boat on Wednesday, when she made a trip from Westminster to Chiswick and back, running the up journey on petrol and on paraffin when making the return run to Westminster. The boat behaved extremely well, and with a fair tide under her ran the eight miles from Chiswick to Westminster in 44 minutes—an excellent performance. On the trial trip the launch attained a mean speed of eight knots, or over nine miles, on trial with a load of four tons and a draught of 12 in. This is a highly satisfactory performance considering the bluff, almost box-like, form of hull necessary to carry the weight on the light draught, the speed being two miles more than was guaranteed. The boat will be shipped out complete, the machinery and fittings being previously taken out and packed in cases.

The dimensions of the *Spider* are similar to those of the stern-wheel motor canoe *Sandfly* now building to the same order. As both launches have to fulfil the same conditions, the trial of the latter boat will form an interesting comparison of the two modes of propulsion—paddle and tunnel screws.

British Bessemer Steel.

The ingots made during 1905 amounted to 2,009,000 tons, an increase on the previous year of 228,000 tons. There was an increase in all the chief producing districts, that of Cleveland giving 57,000 tons to the total increase just stated; whilst West Cumberland and Barrow recorded a gain of 14,000 tons. A considerable part of the output in both the north-eastern and north-western districts named was in the shape of Basic Bessemer. The make of steel rails was the largest in Cumberland, and Lancashire; Cleveland coming second; whilst South Wales produced more bars, billets, and blooms.

Technical Institution News.

Steam Turbine in Ships.

Professor Biles delivered the second of the Keith lectures given in connection with the Royal Scottish Society of Arts, in Edinburgh, on Monday evening. Professor Hudson Beare presided. The lecturer described fully the method of obtaining the efficiency of propellers of different diameters and blade areas, and the method of obtaining the revolutions necessary to drive such propellers to obtain required horse-powers. Recent experiments made in the Washington experimental tank upon models 16 in. in diameter had enabled investigators to conclude that within working limits propeller forces vary as the square of the speed of advance, so that experimental results only at one speed were necessary to enable those at other speeds to be determined. The results of these experiments could therefore be standardised, and the general tendency of the various changes seen.

A Question of Efficiency.

One of the main elements in a propeller is its capability of absorbing and giving off efficiently the power of the motor which drives it. The experiments showed that for similar propellers this power rapidly increases with decrease of pitch ratio; that with small pitch ratios the narrow blades absorb a little more power at low slips than the wide blades up to a certain point, after which as the slip increases the wide blades gradually absorb greater power than the narrow ones. For large pitch ratios the wide blades absorb slightly more power at all slips. Maximum efficiency occurs at lower slips as the pitch and area ratios decrease. The value of the maximum efficiency increases as pitch ratio increases for the smaller area ratios up to 1.2, but slightly decreases afterwards, but in the larger area ratio it continuously increases with increase of pitch ratio. The value of maximum efficiency increases between area ratios .75 and .125, but decreases with further increase. These results show the somewhat erratic

character of efficiency.

Application to Special Cases.

Examples were given showing the application to special cases of these results, the most interesting being those corresponding to a channel steamer of 9,000 h.p., and an Atlantic liner of 24,000 h.p. and a 26-knot vessel having four propellers of 20,000 h.p. Similar curves were shown for cases having the same total horse-power, but divided in each case between two propellers only. It was shown that efficiency of propeller increased with diameter and decrease of revolutions, and that the turbine efficiency increased with increase of revolutions and decrease of diameter of drum. Combining these two tendencies or efficiencies it was shown that in some existing cases better efficiency would be

obtained by the turbine than by the screw propeller, but that a limit is placed to this increase of size of turbine by the greater weight and the greater losses of the larger turbine, though it appears that the maximum efficiency of the combination corresponds to a slightly larger turbine than has been generally adopted.

Practical Economy of the Turbine.

With reference to the matter of the practical economy of the turbine as applied to marine purposes, there is still a great deal of conflict of evidence. Several instances were given and it was stated that there were very few cases in which a direct comparison under exactly similar circumstances could be made. The closest comparisons were those of the Midland Railway boats designed by the lecturer, as they were running on the same service and were exactly of the same form. The comparative results of service were not so favourable to the turbine as those on trial. At first sight it might appear that the extra resistance met with at sea as compared with that on trial caused the large propeller of the twin-screw vessel to be relatively less efficient than the small propellers of the turbine vessel on account of the greater size of the former. But, from results of observations of revolutions extending over long periods it was shown that while the twin-screw vessel had a ratio of resistance at sea to that on trial of about 1 to 1.25, the same test in the turbine vessel made the ratios as much as 1 to 2.25. As the sea did not discriminate between a turbine and a twin-screw vessel in the matter of resistance offered it seemed evident that the propellers of the turbine vessel were not delivering a thrust due to their revolutions in size, and that in order to maintain the efficiency that the turbine showed on trial, it would be necessary in future vessels to modify the relation of the turbine and the propeller to ensure the best results at sea. It seemed that efficiency in trial had been obtained at the sacrifice of efficiency on service, and that the full advantage obtainable in the economy of the turbine had not yet been attained in sea-going results.

Gas-Engine Indicators.

Mr. L. F. de Pevrecave read a paper on this subject at a meeting of the Junior Institution of Engineers held on March 2nd, dealing with tests made by the author and by Mr. F. White.

The object of the tests was to obtain not the most perfect possible results, but rather those which might be expected with care under ordinary working conditions, and for this reason no attempt was made to procure perfectly fitting pistons. In deciding on a suitable method for carrying out experiments on gas-engine indicators many problems asserted themselves, but the course ultimately adopted was to select one indicator as a standard and to compare it successively with all the other

instruments, taking a card on it simultaneously with every other card taken in the trials. That having been determined, the next point was to standardise the standard of comparison; this, although involving a considerable amount of work, proved the most satisfactory means of arriving at useful conclusions.

Results of Tests.

The results of the tests indicate, among other things, the paramount importance of obtaining a close-fitting piston and general absence of friction in the moving parts, while the outside spring is certainly to be preferred for gas-engine work. For accurate observations it is advisable to calibrate the springs for the temperatures at which they are intended to work, the desired temperature being preferably obtained by jacketing. The springs being calibrated for the working temperature the average inaccuracy of an indicator of the standard type on a gas-engine may be considered at about 2.5 per cent., while it may range up to 7 per cent. if this precaution is omitted. In the average gas-engine indicator the error due to friction is the most serious difficulty, and appears to amount, on the average, to over 2 per cent. Friction of the piston is one of the most serious causes of error, but the matter is receiving the attention of manufacturers.

Waterways of India.

Before the Indian Section of the Society of Arts, Mr. Robert Burton Buckley, C.S.I., recently read a paper on the navigable waterways of India. The author stated that the great irrigation works of India water every year about twenty million acres of crops. The canals which carry the water aggregate some 12,000 miles in length, and are supplemented by about 30,000 miles of distributory channels. The majority of these works have been constructed by the British Government during the last sixty years, but some are old native works which have been restored and improved during the same period. These canals have, with one or two exceptions, been constructed primarily for irrigation, and not with a view to navigation. In a certain number of cases, however, the main canals have been so constructed that they can be used for navigation as well as irrigation. Mr. Buckley argued that it seemed wrong that, while railway companies readily obtained free land and a Government guarantee on their capital, navigation companies got neither, and also found it hard to induce the Government to spend anything on improving the waterways. This was the more noticeable when it was remembered that in all countries, other than England and India, large sums were actually being spent on improvements on internal navigation.

Experiments with Lubricants.

At a recent meeting of the Institute of Marine Engineers, Mr. H. Leask gave a lecture on "Oils." Mr. Leask referred to the various specific gravities of oils, and a table was exhibited showing the results of several experiments with various oils, the oils chosen being Southern sperm, white whale, neatfoot, lard, olive, East India and Black Sea rape oils. The variation in gravity was at once noticed; for instance, with thirty-six samples of sperm oil which were examined, there was a difference in some cases from 878 to 884, and a similar disparity occurred in the weights of all other oils shown. On the subject of viscosity of an oil, which has more influence on the lubricating value

than its weight, the viscometer of Sir R. Redwood is in general use in this country. The lecturer named a few oils which it was advisable to use with certain types of machines. For large marine engines he stated that castor oil was frequently used, especially in steamships trading to India and hot climate ports, but cooler and cleaner bearings were said to be obtained from a mixture of a heavy mineral oil and thickened vegetable oil, sp. gr. 925 to 935, viscosity 1,000 to 1,500. With land engines, according to size, pressure and speed, the limits given for marine engines might be usually followed, but where circulating pumps and filters were adopted a thinner oil was advisable on account of the steady and more copious application which it provided without waste of lubricant. Dynamos covered a wide range in respect to oils, on account of their extreme diversity of size and speed. For locomotives the refined rape was giving way to the pale compound engine oils of moderate weight and body.

Lecture on Submarines.

Sir William White has lectured under the auspices of the Northern Scientific Club, on "Submarines." Colonel Saxton White presided, and there was a large attendance. Sir William pointed out that submarines were essentially the weapon of the weaker and poorer Power, which acted mainly on the defensive, and wanted to avoid large expenditure upon its naval forces. A great deal has been spoken and written as to what submarines could do, or were supposed to be capable of doing, but no one who had considered the matter could claim that submarines would ever decide naval supremacy. Every increase in speed involved a corresponding increase in the pressure of the rudder. If an attempt were made to deal with submarines when submerged at high speed, they might depend upon it that the risks would be very great. There was no mystery about the submarine, the lecturer concluded. The principles were perfectly well understood, while an enormous amount of importance was attached to the minutest details. Progress had been made in modern times with the construction of submarines, chiefly because of the advances that had been made in mechanical engineering and metallurgy.

New Instrument for Surveying Deep Boreholes.

In the description of the new instrument for surveying deep boreholes, given by Dr. J. B. Porter at a meeting of the Canadian Society of Civil Engineers, and reproduced in PAGE'S WEEKLY for January 12th, 1906, Mr. W. Helme was described as the inventor of the instrument. This appears to have been a slip on the part of the author of the paper. When describing the new instrument to the members of the Transvaal Institute of Mine Surveyors last year, Mr. Helme was careful to state that it was the invention of Mr. J. H. Ochmen. Those of our readers who desire further particulars of this ingenious instrument will no doubt be glad to have the correct name and address of its originator. Mr. J. H. Ochmen can be communicated with at Smal Street, Johannesburg.

The Dockyards and the Navy.

THE SUPPLY OF THE NAVY ESTABLISHED BY THE MEMORANDUM OF LORD CAWDOR, SECRETARY OF THE ADMIRALTY, ON THE COMPLETION OF THE CONSTRUCTION OF THE DREADNIGHT, IS A SUBJECT OF THE GREATEST IMPORTANCE, AND THE NECESSITY OF MAKING A LONG STATEMENT BY REASON OF THE RECENT DISSERTATION ON NAVAL POLICY MADE BY THE SECRETARY OF THE ADMIRALTY.

The keynote of Lord Cawdor's memorandum—economy with efficiency—is happily unaffected by a change of Government, and the figures now presented are substantially in agreement with it. It is worthy of note that in two years the cost of the navy has been reduced by over five millions sterling. The following abstract shows the increases and decreases as compared with the corresponding votes for last year:—

No.	Description	Net Estimates		Increase	Decrease
		1905-6	1906-7		
I.	NAVY ESTABLISHMENT	12,000,000	12,000,000	—	—
1.	Naval Services	1,800,000	1,800,000	—	—
2.	Naval Stores and Supplies	2,053,300	2,250,000	196,700	—
3.	Naval Subsidies	275,000	275,000	—	—
4.	Naval Law	14,700	14,000	—	700
5.	Educational Services	105,000	101,000	—	4,000
6.	Scientific Services	65,000	60,000	—	5,000
7.	Royal Naval Reserves	420,000	420,000	—	—
8.	Engineering, Repairs, Maintenance, etc.	2,407,600	2,768,000	360,400	—
9.	Naval Stores and Supplies	2,827,000	4,816,000	1,989,000	—
10.	Naval Stores and Supplies	8,588,400	7,827,800	—	760,600
11.	Naval Stores and Supplies	2,000,000	2,000,000	—	—
12.	Naval Stores and Supplies	1,054,500	1,055,000	500	—
13.	Naval Stores and Supplies	472,000	454,000	—	18,000
14.	Admiralty Office	354,500	359,400	4,900	—
	Total	29,408,800	30,966,500	1,000,300	2,000,000
III.	NAVY ESTABLISHMENT	—	—	—	—
15.	Half-pay, Reserved and Retired Pay	820,700	800,000	—	20,700
16.	Pensions, Gratuities, and Allowances	1,256,300	1,233,000	—	23,300
17.	Naval Stores and Supplies	383,700	382,000	—	1,700
	Total	2,460,700	2,415,000	—	45,700
	Grand Total	31,869,500	33,381,500	1,044,500	2,045,700

Net decrease

As regards new construction, the following vessels will be under construction on April 1st:—Six battleships, ten armoured cruisers, twelve destroyers (coastal), five destroyers (ocean-going), one destroyer (very fast ocean-going), one Royal yacht, fifteen submarines and a repair ship.

The battleship *Dreadnought* will be completed early next year, within fifteen months of her commencement, and will cost £1,797,497. Contracts have been entered

into for the construction of three armoured cruisers, named *Indomitable*, *Invincible*, and *Indomitable*. These will be completed within thirty months from the date of ordering.

The twelve coastal-destroyers and the five ocean-going destroyers included in the current year's programme have all been ordered. The former will have a trial speed of twenty-six knots and the latter of thirty-three knots. Negotiations in connection with ordering the special ocean-going destroyer of thirty-six knots' trial speed are nearly complete. The eleven submarines sanctioned by Parliament last spring have been commenced. In addition, in the coming year, the following vessels will be begun: Four armoured vessels, five destroyers (ocean-going), twelve destroyers (coastal), and two submarines. The principal new works provided for in 1906-7 are: At Chatham—Hoo Ness, river-training works, for the purpose of river training; At Portsmouth—harbour protection.

The supply of guns during 1905-6 is reported to have been satisfactory. Improvements have been effected in the designs of recent guns, and steel of greater tensile strength and higher tenacity has been introduced both for new guns and for the repair of the older patterns. The difficulties which have been met within the manufacture of armour piercing shell of a new pattern have been surmounted, and these projectiles have now been generally supplied to the Fleet. There have also been effected improvements in gun mounting, and in the sights, while the supply of the necessary instruments for enabling fire to be opened with accuracy at long ranges which was begun last year, is now well advanced, and the considerable number of ships already fitted with these instruments should show in the returns of battle.

The continuous steaming trials, having been twenty-six hours under way, during twenty-four of which coal was burnt in the boilers, and oil fuel for the remainder of the time. The test with oil fuel is a condition recently imposed by the Admiralty, and in the case of the *Duke of Edinburgh* it is reported to have given reasonable satisfaction. The speed of the ship varied between eleven and seventeen knots, and as the result of the trial, the propelling and other machinery will be taken over by the Admiralty from Messrs. Hawthorn, Leslie and Co.

The announcement is made that British battleships and cruisers are to be provided with searchlights of much greater power, and of 36 in. diameter mirrors, controlled entirely by electric motors.

Successful experiments are said to have been carried

Launches of the Week.

Name of Shipbuilder and Date of Launch	Type.	Name of Vessel.	Principal Dimensions.	Machinery, etc.	Tonnage L.H.P.	Estimated Speed, Knots.	Built to the order of.	Remarks.
Mack & Thomson, Govan (Trial trip, 1,300)	Trawler	<i>Oxino</i>	108 ft. 6 in. by 21 ft. 6 in. by 12 ft. 4 in.	Cylinders, 10 in. 104 in. and 27 in. by 24 in. stroke. Boiler 9 ft. diameter by 9 ft. 6 in. Working pressure, 200 lb.	51 net, 190 gross	9½	Hellens Steam Fishing Co., Hull	
A. McMillan and Son, Ltd., Dumbarton (282,000)	Steel screw steamer	<i>Lizbeth</i>	372 ft. by 50 ft. by 27 ft. 4½ in.	Supplied by Dunsinuir and Jackson, Glasgow	...	...	Mc. Joss, Survee	
Cammell, Laird and Co., Ltd., Birkenhead (212,200)	Steam yacht. Siemens Martin steel up to the gunwale	<i>Portia</i>	103 ft. by 25 ft. 6 in. and 15 ft. 3 in.	Vertical triple expansion engines, having cylinders 14 in., 23 in. and 38 in. diameter, by 2 ft. stroke working at 175 lb. pressure	500	...	H. A. Foster, Queensbury	
William Hamilton, Ltd., Govan (1,300)	...	<i>John Hardie</i>	380 ft. by 52 ft. 3 in. by 28 ft.	By John C. Kincaid and Co. Triple expansion engines, having cylinders 25 in., 41 in., 68 in. by 48 in. stroke	7,400 dead-weight, 4,375 gross	...	J. Hardie and Co., Glasgow	
Swan, Hunter, Wigham Richardson, Ltd., Newcastle (Trial trip, 1,300)	Sister ship to the <i>G...</i>	<i>Lianone</i>	253 ft. by 34 ft.	Four crank triple expansion engines on the Yarrow, Schlick, and Teedy system	...	18 mean speed		
Went, Gordon, Frim, A. J., Sunderland, Scotland, Red (12,700)	Sub-propelling buckets dredger	<i>Lea</i>	115 ft. 10 in. by 78 ft. 10 in. by 33 ft. 10 in.	Triple expansion engine	...	...	Bruce, Ares, and Pacific Railway Co.	Capable of raising 550 tons of soil per hour.
Dodd and William Brender and Co., Ltd., Portlough (Trial trip, 1,300)	Twin screw	<i>Lander</i>	230 ft. by 31 ft. by 18 ft.	Two sets of triple expansion engines supplied by the builders	1,105 gross	15	Christmas Island Phosphate Co., Ltd., London	To trade between Christmas Island and the Channel Islands.
Swan, Hunter, Wigham Richardson, Ltd., Wigham and Co., Ltd., Liverpool (Trial trip, 2,300)	...	<i>Ena</i>	334 ft. by 40 ft. by 25 ft. 3 in.	Constructed by the North Eastern Marine Engineering Co., Ltd. Triple expansion engines, cylinders, 24 in., 30 in., and 66 in. by 45 in. stroke. Two single-cranked boilers, 120 lb. pressure	6,000 dead weight	...	Anglo-Amphibia Co., Copenhagen	
Blyth Shipbuilding Co., Ltd. (Trial trip, 2,300)	Single deck	<i>Alvanor Hamilton</i>	24 ft. by 43 ft. 2 in.	Same as above, with cylinders 23 in., 38 in., and 61 in. by 42 in. stroke	...	...	Northern Steamship Co., Ltd., of St. Petersburg and Copenhagen	

Launches of the Week—(continued).

Name of Shipbuilder and Date of Launch	Type	Name of Vessel	Principal Dimensions	Machinery, etc.	Tonnage	H.P.	Estimated Speed	Builder or Order of	Remarks
Russell and Co., Port Glasgow (1,300)	...	<i>Beaver</i>	385 ft. by 44 ft. 6 in. by 20 ft.	Machinery by Rankin and Blackmore, Greenock	7,200 dead-weight	...	12	Andrew, Wain and Co., Glasgow and London	
Russell and Co., Port Glasgow (1,300)	...	<i>Durham</i>	...	...	...	...	...	Asial Shipping Co., Ltd. (Messrs. Joseph Chadwick and Son, Liverpool)	
R. C. and Sons, Ltd., Middlesbrough (1,414 2/3)	Steel screw	<i>Durham</i>	...	North-Eastern Marine Engineering Co., Ltd., Chatham, 25 m., 42 m., and 68 m. by 45 m. stroke	...	1	174 loaded in ballast trim	The London Franks' Shipping Co.	
R. C. and Sons, Ltd., Middlesbrough (1,414 2/3)	Steel hopper bottom	...	...	Supplied by Pychman Bros., Ltd., of Hull, and Labnitz and Co., of Renfrew	600	...	...	North-Eastern Railway Co.	First of four 100-ton trucks
R. C. and Sons, Ltd., Middlesbrough (1,414 2/3)	Steel decked vessel, three masted, three masted, three masted	<i>Victory</i>	465 ft. by 50 ft. by 30 ft. 2 in.	Triple expansion, surface condensing engines constructed by Fair and Co., Ltd., Stockton	7,000 carrying capacity	...	11	The King Line, Ltd., London	
R. C. and Sons, Ltd., Middlesbrough (1,414 2/3)	Steel screw	<i>Victory</i>	465 ft. by 50 ft. by 30 ft. 2 in.	Richardsons, Westgarths triple expansion engines, 25 m., 42 m., 80 m., and 64 m. by 12 m. stroke	...	...	123	Richardsons, Westgarths, Ltd., A. G., Liverpool	First of four 100-ton trucks
R. C. and Sons, Ltd., Middlesbrough (1,414 2/3)	Steel screw	<i>Victory</i>	465 ft. by 50 ft. by 30 ft. 2 in.	Richardsons, Westgarths triple expansion engines, 25 m., 42 m., 80 m., and 64 m. by 12 m. stroke	...	...	...	Richardsons, Westgarths, Ltd., A. G., Liverpool	First of four 100-ton trucks
R. C. and Sons, Ltd., Middlesbrough (1,414 2/3)	Steel screw	<i>Victory</i>	465 ft. by 50 ft. by 30 ft. 2 in.	Richardsons, Westgarths triple expansion engines, 25 m., 42 m., 80 m., and 64 m. by 12 m. stroke	...	...	...	Richardsons, Westgarths, Ltd., A. G., Liverpool	First of four 100-ton trucks
R. C. and Sons, Ltd., Middlesbrough (1,414 2/3)	Steel screw	<i>Victory</i>	465 ft. by 50 ft. by 30 ft. 2 in.	Richardsons, Westgarths triple expansion engines, 25 m., 42 m., 80 m., and 64 m. by 12 m. stroke	...	...	...	Richardsons, Westgarths, Ltd., A. G., Liverpool	First of four 100-ton trucks

Reports from Abroad.

Continental.

German Iron Trade

There appears to be an enormous depression prevailing as to the measures which are being taken by German firms to prevent the importation of foreign, and particularly Middlesbrough, pig-iron. It is true that the price of English pig-iron, cannot compete with that of Lorraine-Luxemburg in Rheinland-Westphalia, even at the present reduced prices. Yet business can still be done on the coast and in the river districts of the Elbe and Oder. It is against this trade that the reduction of pig-iron prices in Germany is aimed, but, as a matter of fact, quotations in this district must always be regulated by those ruling at Middlesbrough and Glasgow. The recent purchases made in England on account of Rheinland-Westphalia were the direct outcome of the pig-iron famine in Germany, and it is understood that consumers only went to England when it was found impossible to obtain supplies elsewhere. The general position of the pig-iron business is good, and a large business is being done in Thomas iron with Belgium. Some of the iron mines in the Rheinland are certainly being hampered for want of labour, the miners having been attracted to steel works where wages are on a higher scale. The latest intelligence is to the effect that large quantities of English pig-iron No. 3, which have been lately imported into the Rheinisch-Westphalian district at prices ranging from 70s. to 71s. per ton delivered, are only the beginning of a series of such imports.

Some Statistics.

The statistics collected by the Association of German Iron and Steel Masters shows that the output of pig-iron in the German Empire (including Luxemburg) during January, amounted to 1,018,461 metric tons. This is but 10,628 tons, or 1.04 per cent. less than in the record month of December, 1905; while in comparison with the month of January, 1905, it shows an increase of 252,252 tons, or 32.02 per cent. It must, however, be remembered that during the second half of January last year the output was already seriously affected by the great Westphalian coal strike. The production of Thomas pig-iron makes a new high record this month with 656,330 tons, the previous highest having been in October, 1905, with 654,702 tons. We give below some detailed figures in metric tons, with comparison:

	JANUARY	DECEMBER	JANUARY
1906.	1906.	1905.	1905.
Iron, pig	1,018,461	1,029,089	766,209
Cast-iron	41,500	42,500	35,000
Thomas	656,330	654,702	544,000
Swedish	10,000	10,000	10,000
Portland	1,000,000	1,000,000	1,000,000
Total month	1,059,961	1,071,589	805,209
Total quarter	3,179,883	3,214,767	2,415,627
Total year	11,549,883	11,549,883	9,245,627

Activity in German Shipbuilding.

As is the case in the British shipbuilding industry, the German yards at the present time are full of work. Shipowners, evidently believing that the advance in steel prices has not yet reached its limits, are negotiating for new tonnage, and the larger yards, which had already been well supplied with Government orders, are therefore working at full pitch. Thus the Bremen Vulcan Company has 30,000 new tonnage on its books. Of the other great yards on the Weser, the Weser Shipbuilding Company at Bremen is chiefly occupied with ships for the Imperial Navy and the North German Lloyd, and the yard of the I. C. Tecklenburg Company in Geestemünde is likewise busy executing orders for the same great firm, together with new tonnage for the German Steam Shipping Company at Hamburg.

Regulation of Shipbuilding Prices.

It is stated that an association of the principal shipbuilding firms in Germany has been formed, the chief object of which is to regulate prices and to provide uniform employment in all yards, and also to try to effect a reduction in the cost of estimates. The agreement was signed on March 1st.

The Urft Dam.

This dam, by means of which the well-known valley of the Urft is to be converted into a huge reservoir, holding 1,600 million cubic feet of water, is practically completed. The dam is segmental in plan, its mean radius being 200 metres. Its height is 58 metres; length at bottom, 228 metres; and width, 50.5 metres. It contains over 200,000 cubic yards of masonry. The impounded waters are to be used for supplying a hydro electric power station, the quantity of water disposable being equivalent to 3,600 kilowatts during 7,200 hours per annum; but as the full power will not be taken during so long a period, the plant actually installed will be of considerably greater capacity. The head available will vary from 230 ft. to 330 ft. Electricity will be generated as three-phase current at 5,000 volts, which will be transformed up to 35,000 volts for transmission by overhead conductors. Part of this current is to be supplied to the city of Aix-la-Chapelle. The loss on the line is expected to be not over 10 per cent.

British Coal in Germany.

It will be seen from the subjoined figures, which are taken from an official report on the import trade of British and German coal into Hamburg last year, that the aggregate importations of British and Westphalian coals to Hamburg were about 650,000 tons greater than in the year 1904. This excess was entirely due to increased importations of British coal; for those of Westphalian coal were

loss than in the previous year. Imports of coal into Hamburg:

Year.	British.		German.	
	Tons.	Value.	Tons.	Value.
1904	10,000	£1,000,000	10,000	£1,000,000
1905	10,000	£1,000,000	10,000	£1,000,000
1906	10,000	£1,000,000	10,000	£1,000,000

Notwithstanding the fact that imports of American coal to Hamburg in 1905 were quite trifling.

The prospects for the present year for the Westphalian coal trade, as well as for the import trade of British coal into Germany are, however, considered to be very favourable. All over Germany different kinds of public works are being taken in hand, and at Hamburg alone the extensive works for improving the existing railway arrangements, the construction of new local electrical lines, of a tunnel under the Elbe, of the new shipbuilding yard of the "Vulcan" Company, will call for large supplies of coal. It may be here added that the new dock at Hamburg for British colliers has been considerably enlarged, so that the number of unloading berths for the vessels is now greater than before.

German Metal Worker's Demands.

The Berlin Lokal Anzeiger publishes a message from Essen, according to which the Metal Workers' Syndicate are engaged in an agitation in favour of the introduction of a ten-hours' day, the establishment of a minimum wage, the regulation of night and Sunday-duty, and the election of workmen's committees for the founders and moulders. This propaganda is being carried forward throughout the Empire, and it was declared, at a recent meeting in Gevelsberg, that if these demands of the syndicate are not acceded to, there is nothing left for that body to do but to proclaim a strike.

Probable Imports of Cleveland Iron.

So far as the Continental iron trade is concerned, there seems to have been no deterioration in the position during the past month. Indeed, in Germany rather the reverse is the case. Producers appear still to have some difficulty in dealing with the orders which are coming in, both the home and the export trade being exceptionally active. This situation gives rise to hopes, referred to in a paragraph on the previous page, that Germany will be able to take an increased quantity of Cleveland iron from this country during the spring, more especially as the iron-foundry trade there has shared in the general prosperity. Should this be the case, it may quickly alter the views of speculators with regard to warrants, but it may be well not to be too sanguine on this head, for the rapid increase in the output of German pig-iron has to be taken into account. In Belgium the feeling is not so strong, although prices remain very steady.

The Effect of the New German Tariff.

The new and carefully devised German Customs Tariff came into operation on March 1st, and some information concerning its influence on British

industries will be of real interest. It is true that the information can be obtained by anybody who has the requisite time at his disposal from the Board of Trade translation, but as this is a somewhat bulky volume, with a new method of classification, a full understanding of it makes a call on the time of the business man which he is but infrequently disposed to devote to such a purpose. There is a feeling that the introduction of this new tariff marks a crisis in British trade with Germany, and it is not unreasonably contended that the character of the duties imposed is such as will inevitably lead to a serious contraction of that trade with Germany. In many instances the new duty is a considerable advance on the old, and it is to be noted that the few instances in which the new tariff is lower refer mainly to raw materials and not to manufactured goods. On anchors the increased duty per 100 kilos is 2 marks, on tools it has risen from 15 to 20 marks, on steel pens from 60 to 60 marks, on sewing needles from 60 to 100, on machine needles from 60 to 500 marks, on files up to 6 in. the increased duty is from 15 to 28 marks, on wire (covered) from 12 to 36 marks, and steel rules and gauges pay 28 marks in place of 10. From these few examples quoted above it is clear enough that the new taxes will fall particularly heavy upon certain industries. One important feature to which attention should be directed is that other countries are negotiating for a remission of the high duties of the general tariff, but the most-favoured-nation clause will apply to Great Britain

(A. COMES OF IT.)

Proposed Export Duty on Swedish Iron Ore.

Replying to the Second Swedish Chamber to an interpellation of Professor Kjellen, as to whether an agreement existed between Sweden and any foreign Power which would restrict Sweden's liberty in imposing an export duty on iron ore, the Minister of Foreign Affairs stated that the Swedish Government had perfect freedom of action in the matter. He added that he did not, however, mean by this to express any view as to the necessity of imposing such a duty, or of imposing it at a certain time.

The Feeling in England.

The British Iron and Coal Trades Association has given expression to the general feeling of uneasiness with which iron producers view the agitation on the part of a large section of the Swedish Parliament in favour of imposing an export duty on iron ore. Several motions are before the House, two of which favour an impost of 20 öre on each ton of ore exported, and in addition urge the expeditious determination of the best method of adjusting the duty in proportion to the quantity of iron contained in the ore. Three other proposals favour a duty of 50 öre, and one that that duty shall be a minimum, but that all exported ores with an iron-yielding quality of over 60 per cent. shall be sub-

the justification for the new departure given is the

Sweden for the use of all her mineral resources in the development of her home industries. Exports of Swedish pig-iron do not exceed 600,000 tons, of open hearth ingots, 210,000 tons, of Bessemer ingots, 113,000 tons, blooms and billets, 226,000 tons, and bars have never reached a total of 200,000 tons. In the absence of coal and coke it is difficult to see how this comparatively limited production can be greatly extended. The present output of Swedish iron ore is about 3,000,000 tons, the greater part of which is sent to Germany, Great Britain, Belgium, and France in the order named. Considering the enormous iron-ore resources of the country, it would seem that the apprehensions entertained of an early exhaustion of the available supplies are quite unjustified.

Effect of Hot Riveting.

The effect of hot riveting on rivet steel has been the subject of recent experiments described by M. Frémont. Samples of various kinds of rivet steels—first, without treatment; secondly, after heating to the usual riveting temperature, and cooling without undergoing any work; and, thirdly, after being formed into a rivet were riveted whilst hot under a pressure of 25 tons, and allowed to cool under the tension due to contraction, etc. The results of the tests—tensile and impact—show that in each case the material has been decidedly improved in quality by cooling under tension. As the brittleness is not increased, it does not seem possible to account for the increase of tensile strength as an effect of the rapid cooling.

Colonial and Foreign.

Colombo Harbour Works.

The new graving dock at Colombo was recently filled for the first time, and this incident marks the practical completion of these important works. The three breakwaters enclosing an area fifty acres larger than the new harbour at Dover. The north-west breakwater is 2,670 ft. in length, 32 ft. in width, while the foundations of the block work extend to 30 ft. below low water. It is founded throughout that level on a rubble base. The main or southern entrance to the harbour is 800 ft. in width, and the northern entrance 700 ft. in width. The graving dock is 700 ft. long, 82 ft. in width at entrance, with a bottom depth of 63 ft. over the sill. The pumping engines are of the most modern type, and have been tested to discharge 67,000 tons of water in 3½ hours. The work now so near completion is only part of a vast engineering scheme which will be eventually carried out. There is a project for an enclosed dock or inner harbour with easy communication to the main railway line which presents no particular engineering difficulties, although the estimated cost, which is put down at three millions sterling, makes the carrying out of the project impossible at the present time. This proposed dock would cover 115 acres, provide 13,200 ft. of quay space, take thirty-five of the largest ocean-going steamers in 30 ft. of water, and have a jetty at the east end 1,500 ft. long, by 500 ft. wide, with two parallel lines of sheds. The dock to which reference is made above is expected to be opened in July or August next.

The Cape Town Water Scheme.

The reports of the engineers have now been issued. That of Mr. T. Stewart is drafted on the lines of the Cape Peninsula Commission's report of 1902, and considers alternative supplies drawn from the Berg River or the Wemmer's Hoek Valley. For the former scheme will be required the construction of a dam to impound 1,063,000,000 gallons of water, costing £738,000; a steel pipe line, £377,000; and a balancing reservoir, £10,000; or a total of

£1,125,000. For the latter scheme a dam to impound for six months 2,025,000,000 gallons, giving a daily supply of 10,000,000 gallons, at £492,000; or a smaller dam, giving a supply for five months, £450,000; with a steel pipe line costing either £375,000 or £250,000, the latter for a five million gallons daily supply; the balancing reservoir in both cases costing £10,000 each; the totals being £877,000 and £752,000. The five million gallons supply from the Berg River includes dam, £738,000; pipe line, £264,000; and balancing reservoir, £10,000; or a total of £1,012,000. The schemes propounded by Messrs. John Taylor, Sons, and Santo Crimp, Westminster, S.W., are three in number, and make provision for thirty years for a maximum population of 175,000 persons. They are:—(1) Impounding of 5,000,000 gallons, and supply by 5,500,000-gallon capacity single main, £573,000; (2) 7,500,000 gallons, and single 7,500,000 gallon main, £742,500; and (3) 10,000,000 gallons, 5,000,000 gravitation main, £707,000. The decision rests with the Joint Committee.

The Halifax Dockyards.

The Imperial Government has offered to transfer to the Canadian authorities the Halifax dockyards, including the dry dock and residences. The Marine Department is accordingly prepared to take over the property.

Egyptian Steamer Services.

Passenger steamers are now running between Port Said and Matruh. The steamers were built for the Menzaleh Company by the Anglo-American Nile Company in the latter's workshops at Karputy. They are of the stern-wheel type, with double promenade decks. Tugboats and cargo barges have also been constructed. Owing to the shallow waters traversed some difficulty has been experienced in attaining the estimated speed, and it is possible that dredging operations may be undertaken. The service will be facilitated when the canal is continued up to Koswa, where a quay is under construction.

United States.

American Iron.

THE PITTSBURGH POST-GAZETTE, in its weekly review, states that the pig-iron market has been dull with a deadlock between buyers and sellers. The uneasiness of sellers has caused signs of weakness in the market, as consumers believed that the top had been reached and were withholding their orders. It is reported that the letting of cast-iron pipe contracts by Western cities has been postponed, but the consumption is enormous, and, despite a record-breaking output, stocks are shrinking. Shipments of finished material are on an unparalleled scale. The outlook for structural steel is brilliant, and a large amount of business in sight. Contractors in New York are estimated to have to place before May 200,000 tons of shapes, and a further 300,000 tons before next fall. The American Bridge Company has closed a contract for 60,000 tons. The Pennsylvania Railroad is negotiating for 25,000 tons of rails. It is untrue that a final rupture has taken place in the ore lands deal, which will be resumed later. The foreign demand for rolled products

is wisely placed where repairs are necessary. Its analysis is as follows: silica, 0.105 per cent.; alumina, 7.76 per cent.; oxide of iron, 0.42 per cent.; lime, 0.34 per cent.

Cast Steel for Locomotive Cylinders.

Cast steel is being used in a field which was formerly filled exclusively by cast iron; namely, the construction of locomotive cylinders, and saddles. The Penn Steel Casting and Machine Company, of Chester, Pa., recently cast and finished several steel cylinders for the New York Central Railroad. One of the advantages found in these cylinders was that thinner sections could be used than in cylinders made from cast iron.

Armour Plate Bank Vaults.

The Carnegie Steel Company has just closed a contract with the Commercial National Bank, of Chicago, for the construction of the largest armour-plate safety deposit vault in the world. It will be 46 ft. square and 9 ft. high, and the material to be used is the nickel Harveyised face hardened steel identical with that used by the United States Government to protect its battleships and cruisers.

Creosoting Timber.

Some particulars are given by Mr. P. F. Dundon, in a paper read before the Wood Preservers' Association at Chicago, of a process adopted for creosoting Oregon pine. By ordinary methods of creosoting, it has been found that with Douglas fir, which is of a dense nature, it is difficult to obtain a deep penetration of the preservative, and that the penetration is irregular, varying from $\frac{1}{2}$ in. to 2 in. in different parts of the surface. The process described by Mr. Dundon consists in submerging the timber in creosote inside a retort, which is heated until the creosote attains a temperature of from 212 deg. Fahr. to 220 deg. Fahr. At this temperature the oil will not boil, but the water and sap which are contained in the timber absorb heat from the oil and evaporates, the vapour passing off freely through a condenser. It is stated that the timber treated in this way has its strength and elasticity preserved, and that piles so treated become harder than in the natural state, while those treated by the steam vacuum process become soft, stringy, and brittle.

Portland Cement Industry in America.

The industry continues to make very rapid strides. Whereas in 1890 there were 16 factories producing annually 335,000 barrels of Portland cement, there were, in 1895, 18 plants, with an estimated annual output of 31,000,000 barrels. The manufacture has increased about 100 fold in 16 years, for in 1880 the total production was 300,000 barrels. Since the extension of the use of this material the amount of natural cement produced in America has rapidly diminished.

Large Orders for Finished Steel.

The latest advices from Pittsburg report that during the past week the orders for pig-iron have been small, but very numerous both for foundry and basic pig, which are steadily held. Northern Forge iron is, however, lower. It is now believed that the market will be sustained owing to the heavy consumption going on. Grey Forge is quoted \$17.10 laid down at Pittsburg. In the finished steel trade the pending enormous local building contracts referred to above are the feature.

American Ship Canal Scheme.

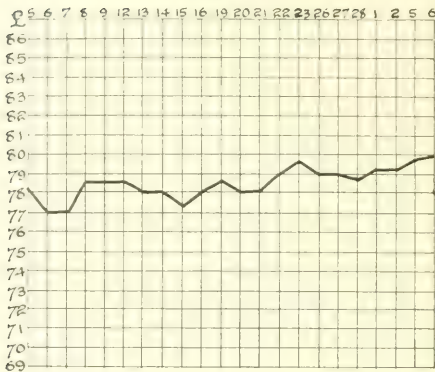
An important canal measure has just been passed by the House of Representatives. The Bill incorporates the Lake Erie and Ohio River Ship Canal with an authorised capital of £12,000,000. Bitter opposition is being developed against the measure, on the ground that the feeders of the canal system would have a serious effect upon the Falls of Niagara. The advocates of the canal have declared that if constructed it would furnish the missing link in the chain of waterways by which vessels will eventually be enabled to make inland voyages either from New York or Canadian ports to the Pacific Ocean, via Lake Erie, the Mississippi River, the Gulf of Mexico, and the Panama Canal.

New Lining for Furnaces.

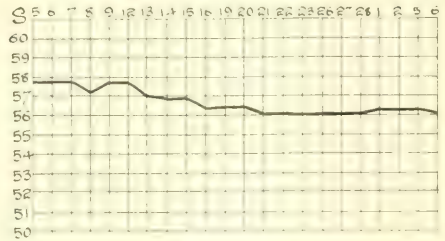
Robert Dixon and Co., of Pittsburg, have brought out a new lining for parts of furnaces which are exposed to the hottest parts of the flame, such as soaking pit arches, blocks of crucible furnaces, back and front walls, and jambs and doors of heating furnaces, and bridge walls. The material is known as Dixonite, and it is stated will not shrink or expand to any degree, and can be rammed or other-

The Home Metal Market. February 5 to March 6.

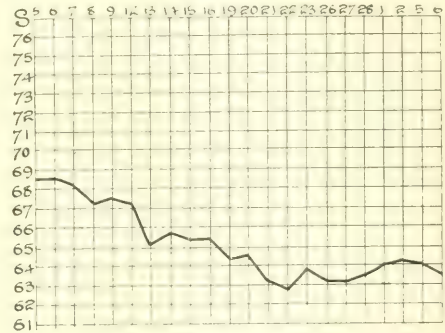
Copper.



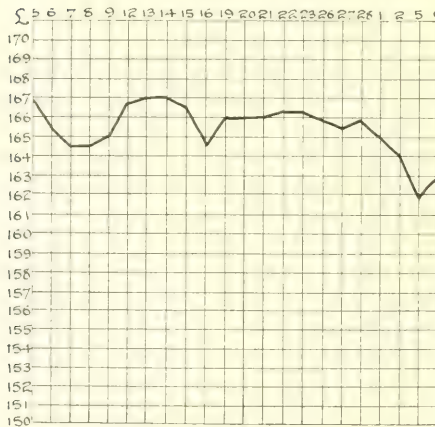
Pig Iron: Scotch.



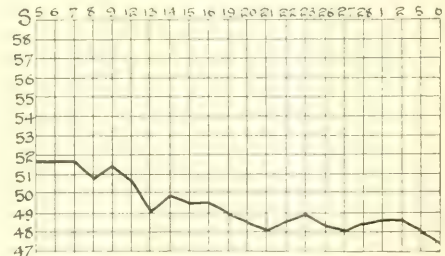
Hematite.



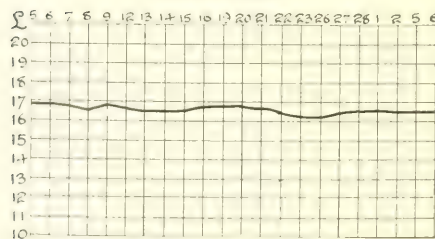
Tin.



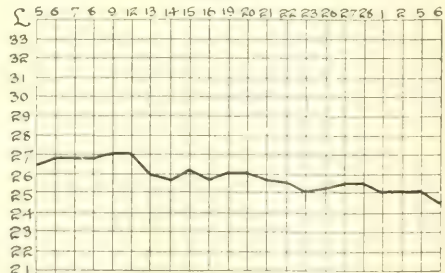
Cleveland.



English Lead.



Spelter.



Engineering in the American Navy.

IN the engineer officer in the British Navy, it is interesting to turn to the experience of America in the matter of engineering organisation. We are enabled to do so from the American point of view by reason of a paper entitled "Is Amalgamation a Failure," which Lieut.-Commander L. H. Chandler has just laid before the United States Naval Institute.

The paper is of exceptional interest for the writer, who since the passage of the Personnel Bill in 1890, has been a consistent believer in the amalgamation of the line and engineer corps. "Follow naval history," he says, "from the beginning, and you will see that from the days when sea warfare first became a science 'amalgamation' has been the key to success."

Until 1860 in the American Navy there had always been two separate corps of officers employed, the line and the engineer corps. By that date, however, the clamour for something better had become so persistent among the more progressive officers of the navy (headed by the then Assistant Secretary of the Navy, the Hon. Theodore Roosevelt) that the old conservative element was routed, and the "Personnel Bill," under which it is now organised, became law, amalgamating the line and engineer corps, and making all officers of the new line (subject to certain well-known and important, but temporary exceptions) subject to duty on deck or below as the exigencies of the service might demand.

Points for Attention.

The training afforded by the United States Naval Academy is discussed in detail, the author concluding that from no engineering school in the world does any young man go forth better equipped to become a proficient engineer, either theoretically or practically. He concludes that the Naval Academy graduate of to-day is in possession of ample knowledge to enable him to pass the required examination for license as a chief engineer of an ocean-going steamer of unlimited tonnage.

So far as engineering is concerned, however, he points out that the letter and spirit of the Personnel Bill have, for various well-known reasons, prominent among which has been the scarcity of officers, not been complied with in the following particulars:

(a) Young officers have not, in general, been given subordinate engineering duty.

(b) Young officers of but little experience of any kind have been given more highly responsible duties in engineering than they have in other branches.

(c) Young officers have not been encouraged to give special attention to engineering, and such as have done so have done it without any special assistance or smoothing of their path. These statements, by the way, are merely an epitome of the remarks of the engineer-in-chief. Within certain limits, he is convinced that the present organisation is most admirable if carried out in its entirety.

Designing.

There is a phase beyond this, however, in regard to which he, as a most consistent and ardent

advocate of amalgamation, believes a change should be made. This is not in relation to steam engineering alone, but relates to ordnance and electrical engineering as well. It is the question of providing, not operating engineers of the several branches mentioned, but designers.

That constant sea-going does not permit a man to fully develop his latent abilities as a designing mechanical engineer of any branch is shown to be acknowledged in foreign navies by the fact that most of their designers are non-sea-going civilian employees. This foreign practice he believes to be as far from the happy mean in one direction as the American is in the other, for it is hard not to believe that it is not only advisable, but absolutely necessary, for the designer to have some practical experience afloat with the gear which he is called upon to design.

As regards the cry for more engineers, it is pointed out that at the time of the passage of the Personnel Bill the navy had just been enormously enlarged, and it has remained so enlarged ever since. Had the Personnel Bill never been passed, there would to-day be exactly the same outcry for more engineer officers, and the need would be just as great. The demand for more line officers is to-day just as great, if not greater, than that for more engineers, and it would be just as correct to charge the present shortage of line officers caused by the expansion of the navy to the workings of the Personnel Bill. . . . as it is to charge upon that measure the present strong need for engineer officers caused by the same enlargement. . . . In other words, it is denied that the amalgamation has reduced the number of competent engineer officers available, and asserted that the present cry for more engineers is caused exclusively by the same reasons that have brought about the present great scarcity of sea-going officers of both branches.

The author expresses his belief in a line of the navy, each member of which shall be able to perform efficiently the daily duties of the ship in all branches, on deck and in the engine-room, and the care and handling of turrets, guns, machinery, and torpedoes, the caring for and running of dynamos and motors, and even, iconoclastic as it may seem, the handling of the accounts of the pay as well as of all other departments. Let each man seek his bent in designing engineering, one or more branches, and with the system of warrant and petty officers now in existence, the author believes that the United States would have the finest organisation in the world.

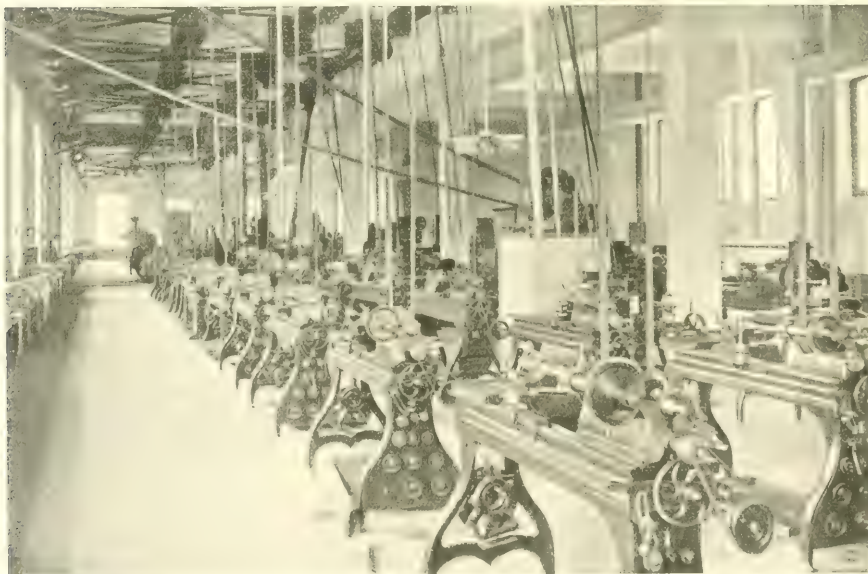
U.S. Naval Academy.

A description is given of the present plant for instruction in engineering at the United States Naval Academy, commencing with the Model Room.

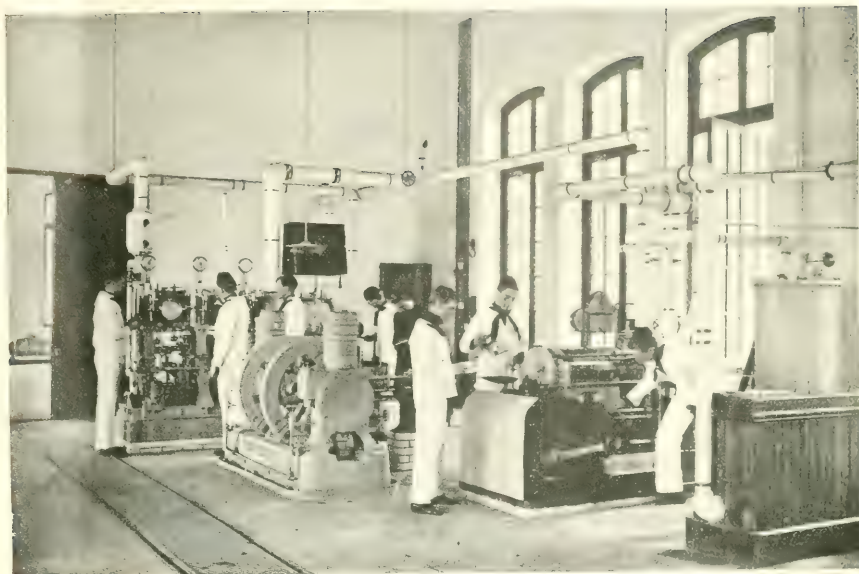
This contains types of the different auxiliaries, air, circulating, and feed pumps, etc., found on board naval vessels; sectional models, valves and valve gearing; models of triple and quadruple expansion engines; indicators; types of steam turbine vanes; models of steam steering and capstan engines; full-size working model of the United States steamship *Connecticut's*



MACHINE SHOP, U.S. NAVAL ACADEMY. — INDIVIDUAL ELECTRIC DRIVE.



ANOTHER VIEW IN MACHINE SHOP. — GROUP SYSTEM, ELECTRIC DRIVE.



A CORNER OF THE ENGINEERING LABORATORY.



THE IRON AND STEEL FOUNDRY.

tional and working models of steam launch engines; working model of valve gear and link motion; elements of Niclausse, Babcock and Wilcox, and Cahall boilers; together with the various naval construction models in the way of sections of various types of ships; and working models of machinery under the cognizance of the Bureau of Construction and Repair. Various instruments of precision, as well as fuel and gas-testing apparatus, are also provided.

Mechanical Laboratory.

This contains one air compressor; two Wheeler condensers; one triple-expansion experimental engine with tank; one dense air and one ammonia ice machine; one evaporating plant with pumps and distiller; one sixteen-kilowatt marine direct-connected generator; one twenty-five-kilowatt generator driven by a Curtis steam turbine; one 15 h.p. De Laval steam turbine; one Richle testing machine; one complete set of pneumatic tools, with all attachments; two engines for disassembling, marking adjustments, etc.; one Roots blower; and Prony brakes, dynamometers, and engine- and boiler-testing apparatus.

Woodworking Shop.

The department consists of sixteen woodworking lathes; one power-driven band saw; one power saw bench; several hand-power tools and benches. The power machinery is motor driven.

Machine Shop.

The equipment consists of the following tools, part driven by motors and part by belts and shafting: thirty-seven lathes, from 14 in. to 27 in. swing; four planers, six shapers; four drill presses; three sensitive drilling machines; one combined drilling and slotting machine; three milling machines; three slotting machines; one radial drill; one spliner; one grinding machine; two boring machines; one pipe cutting machine; three tool grinders, one milling cutter and tool grinder; and one drill grinder. A vise bench accommodating seventy midshipmen is also available.

Coppersmith Shop.

A shop of good capacity and well equipped is available.

Foundry.

This is in progress of considerable expansion, and will have a small cupola, complete with blowers, elevator to charging door; core oven; cranes; crane ladles; brass furnaces, etc. Oil fuel is used for the brass furnaces.

Forge.

This is supplied with twenty-eight forges, with necessary outfit; a steam hammer and an oil annealing and hardening furnace.

Boiler Shop.

This is equipped with a Ward round boiler, and with two small units of the typical water-tube boilers of the United States Navy. These are used for boiler-test instruction and to drive so much of the general steam

engineering plant as is not motor driven. This shop is fitted as a building and repair shop for instruction in construction and repair of all types of shell and water-tube boilers.

Mould Loft.

A large room has been laid off for practical instruction in mould-loft work.

Drawing Room.

A large well-equipped drawing room is provided.

Electrical Equipment.

A three-wire system of lighting and power mains is installed with accessories, and is used for purposes of instruction.

Work Afloat during Academy Year.

A number of modern ships of different types are maintained at the Academy for this work.

Work Afloat during Practice Cruises.

In the summer the first, second, and third classes go aboard ships of all types, from battleships down, for three months in each year.

Battle Practice Results.

The results of battle practice by the British Fleet last year show a very considerable improvement, and the average range at which the practice was carried out was much longer than in previous years. The following are the squadrons and ships in order of merit:

Ship	No. of Shots	No. of Hits	First Ship in Squadron	Score
Cornet	108	1	.....	17475
1st Cruiser Squadron	108	1	<i>Lavation</i>	20085
2nd Cruiser Squadron	108	1	.....	221
3rd Cruiser Squadron	108	1	<i>.....</i>	174
4th Cruiser Squadron	108	1	.....	21072
2nd Cruiser Squadron	108	1	.....	1773
1st Cruiser Squadron	108	1	.....	2
3rd Cruiser Squadron	108	1	.....	108
4th Cruiser Squadron	108	1	.....	177
5th Cruiser Squadron	108	1	.....	177
6th Cruiser Squadron	108	1	.....	177
Total	108	1	.....	177

Obituary.

MR. JAMES EDWARD TUTT, M.Inst.C.E., whose sudden death occurred on the 20th ult., was a director of Sir William Arrol and Co., Ltd., and took an active part in the construction of the Forth Bridge. He was in sole charge of the Tower Bridge works, and his designs are now being carried out for the new bridges in process of construction at Cairo. Deceased was only 46 years of age.

COMPANY	TERMINI	Mileage	Minutes of Journey	Speed per hour
G. W.	Paddington to Exeter	196 1/2	293	40
L. & N. W.	Euston to Liverpool (Edge-Hill)	192	315	36
L. & N. W.	Wigan to Willeston	188 1/2	311	36
G. N.	Wokingham to Westgate to Kings Cross	175 1/2	310	34
Great Central	Marylebone to Sheffield	164 1/2	304	34
L. & N. W.	London to Crewe	158	295	33
G. N.	King's Cross to Doncaster	156	290	33
L. & N. W.	Widnes to Crewe	152 1/2	286	32
G. N.	Carlisle to Perth	150 1/2	295	31

is 20 miles. On Saturdays it is higher, as on that day they get in more than 200,000 passengers.

These speeds are all the more remarkable in that at their two ends the lines run for an average distance of a mile on the public roads, where their nominal speed is reduced to 15 miles an hour, and in that both lines meet outside London on a right-of-way with a system of signals based on the principle "first come, first served."

On certain occasions the Philadelphia and Reading railway's Atlantic City Flyer has covered the 55.5 miles in 46 1/2 minutes, which means an average speed of 71.6 miles an hour; for 35 miles it was 81.5 miles an hour.

The world's fastest train for a distance exceeding 300 miles, is the New York Central and Hudson River's Empire State Express, as the figures hereafter show:

Empire State Express, from New York to Buffalo, 430.52 miles in 8 hours 15 minutes. Average speed: 53.3 miles an hour.

From London (King's-cross) to Edinburgh, 393 miles in 7 hours 45 minutes. Average speed: 50.7 miles. From London (Euston) to Glasgow, 401 miles in 8 hours. Average speed: 50.1 miles.

And from Paris to Boulogne, 100 miles, in 1 hour 10 minutes. Average speed: 45 miles.

The Paris and Lyons Company announces for next winter, a train to run the 675 miles between Paris and Nice in 13 hours 30 minutes,* and this will then be faster than all the afore-mentioned trains.

Great Britain.

In 1893, the speed of a large number of English trains was accelerated to a most remarkable degree and the table on page 529 gives the trains which run at an average of over 55 miles an hour.

The Great Northern Company has four trains that run at a speed of over 58 miles an hour. Three stages without a stop are over 100 miles long and the total journey of 430 miles is done at an average speed of 58 miles an hour.

The above table shows the longest runs without a stop in England (over 150 miles).

The following are some remarkable runs of English trains on special occasions:—

The Great Northern Company's train from London to Newcastle, in 1899, has been the fastest ever run in Great Britain.

DATE	TERMINI	Mileage	Time of Journey in hours.	Stops.	Speed per hour between stops.	Length of train in miles.
June 19,	London to Carlisle	290 1/2	6:00	Nil.	49.8	..
— 22,	Carlisle to London	290 1/2	6:05	Nil.	49.2	4
July 10 to 11,	Saint-Pancras to Carlisle	310 1/2	5:30	11	58.2	4
July 14,	Paddington to Plymouth (North Road)	215	3:53 1/2	Nil.	63.0	1 1/2
— 29,	Victoria to Brighton	50 1/2	45:1 1/2	Nil.	62.7	..
— 29,	Brighton to Victoria	50 1/2	45:0 1/2	Nil.	66.4	1 1/2
December 4,	Marylebone to Manchester	200	3:35	5	57.7	8

Line	Distance	Time	Speed
New York to Philadelphia	94	1:18	41.28
Philadelphia to Buffalo	288	3:06	39.86
New York to Buffalo	382	4:24	39.46
Buffalo to Saint-Louis	540	5:20	39.66
Baltimore to Buffalo	288	3:06	39.86
Cleveland to Saint-Louis	340	4:10	39.51
Buffalo to Cleveland	288	3:06	39.86
Philadelphia to Pittsburgh	164	2:12	39.12
Buffalo to Chicago	340	4:10	39.51
Cincinnati to Saint-Louis	288	3:06	39.86
Pittsburg to Saint-Louis	288	3:06	39.86
Cleveland to Chicago	340	4:10	39.51
Baltimore to Pittsburgh	164	2:12	39.12
Cincinnati to Chicago	288	3:06	39.86
Cleveland to Cincinnati	288	3:06	39.86
Pittsburg to Chicago	288	3:06	39.86
Chicago to Saint-Louis	288	3:06	39.86
Pittsburg to Cleveland	288	3:06	39.86
Baltimore to Cincinnati	288	3:06	39.86
Pittsburg to Cincinnati	288	3:06	39.86

American Services.

From the above table can be seen the present service of trains between the most important American towns. The average speed is that of all the trains running between two given towns, and this rule also applies when two towns are served by two or more railways. The table only contains the fast trains running long distances without stopping and not trains with many stops.

Remarkable Special Runs.

Lastly, there is a table giving some particularly remarkable runs made in 1903 on special occasions:—

Incorporated Municipal Electric Association.

subjects:—The commercial development of electric power; boiler house plant; steam turbines; etc.

RAILWAYS.

Line	Distance	Time	Average speed between stations.
Atlantic City to Philadelphia, P. & R. Ry.	84	1:18	41.28
Camden to Atlantic City, P. & R. Ry.	84	1:18	41.28
New York to Chicago, 20th Century Ltd., N. Y. C. Railway	340	4:10	39.51
New York to Chicago, N. Y. C. Railway	340	4:10	39.51

Thames Barrage Scheme.

A conference of local authorities, citizens, and traders was held at the Mansion House last week, to consider the proposal to construct a barrage across the Thames at Gravesend. The scheme was strongly opposed, and a resolution in favour of an expert inquiry into the matter was defeated.

Carnegie Research.

The Earl of Elgin, in moving the adoption of the report presented at the fifth annual meeting of the Carnegie Trust, adverted to the quinquennial scheme of grants to the Universities, remarking that the time was approaching when the second distribution would have to be considered. With this in view the committee had already written to the University authorities requesting their opinions on the matter. By the end of the year it was hoped that the committee might be in a position to submit a new scheme for the approval of the trustees. More money had been spent on the research scheme during the current academic year than during last year, but although this scheme had not yet reached a stage at which a full report could be given, the committee were satisfied that good work had been and was being done.

The scheme of endowment of post-graduate study and research has now entered upon its third year, and is being carried out on the lines and under the regulations described in previous annual reports. Appointments were made to sixteen fellowships and to twenty-seven scholarships, and grants of various amounts were assigned to forty-three applicants. The list of Fellows includes eight Fellows of the previous year, as well as four scholars whose published work justified their promotion. Of the other scholars of 1904-5, five have been reappointed for the current year. The total expenditure for 1904-5

under the scheme of endowment of post-graduate study and research was £4,326 2s. 6d. The estimated expenditure for the current academic year is 16,770 3s. 6d.; but from previous experience it seems improbable that the whole of this amount will be required.

Royal Commission on Canals and Waterways.

The King has been pleased to appoint a Royal Commission to inquire into the canals and inland navigations of the United Kingdom and to report on—(1) Their present condition and financial position; (2) The causes which have operated to prevent the carrying out of improvements by private enterprise, and whether such causes are removable by legislation; (3) Facilities, improvements, and extensions desirable in order to complete a system of through communication by water between centres of commercial, industrial, or agricultural importance, and between such centres and the sea; (4) The prospect of benefit to the trade of the country compatible with a reasonable return on the probable cost; (5) The expediency of canals being made or acquired by public bodies or trusts and the methods by which funds for the purpose could be obtained and secured, and what should be the system of control and management of such bodies or trusts. The following are the Royal Commissioners: The Right Hon. Lord Shuttleworth (chairman), Lord Kenyon, Lord Brassey, K.C.B., Lord Farrer, the Right Hon. Sir John Dorington, Sir John Brunner, M.P., Sir Francis Hopwood, K.C.B., C.M.G. (permanent secretary to the Board of Trade), Dr. A. J. Herbertson, Messrs. W. J. Crossley, M.P., Russell Rep, M.P., J. F. Remnant, M.P., P. Snowden, M.P., Henry Vivian, M.P., L. A. Waldron, M.P., R. C. H. Davison, J. P. Griffith, J. C. Inglis, H. F. Killick, and John Wilson. Mr. W. B. Duffield, M.A., barrister-at-law, will act as secretary.

6-in. Bush Grinding Machine.

By Messrs. H. W. Ward and Co., Birmingham.

THE machine illustrated is adapted for grinding bushes, ball bearing rings, the holes in milling cutters, internal gauges, etc. The body is a box casting, the top part being securely fastened to the base, and the whole forming a rigid foundation for the working parts.

The work headstock has a screw adjustment by a screw hand wheel for putting on the cut, and this movement is indexed in 1-1000th of an inch. A swivelling rest is also provided for the purpose of grinding. To ensure the headstock always being brought into the correct position for parallel work, a peg is fitted which accurately locates the head.

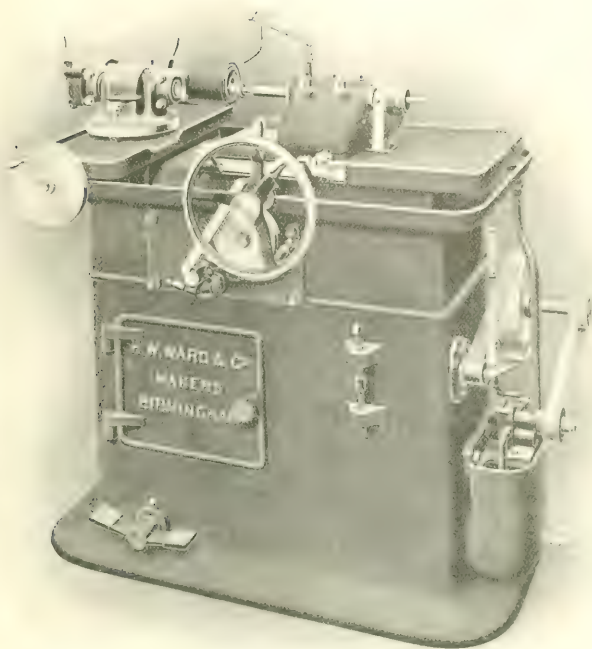
The machine runs in parallel adjustable gun-metal bearings, adequate arrangements being made for taking the thrust and oiling. The spindle is hollow, and may be arranged

with either an ordinary chuck or a special chuck, a spring chuck operated by the lever at the left-hand end of the headstock. This spindle is carried in a bracket which can be swung forward, so that the gauges may be tried in the work without moving the emery wheel headstock away from the work.

The emery wheel headstock is mounted on a long slide which slides on the top of the bed. It has a guiding vee on one side, and a plain sliding surface on the other.

It has adjustable automatic longitudinal traverse and reversing motion. The headstock may be moved along the slide, and bolted to same in any convenient position. It is very solid in construction, thus preventing vibration from the high-speed at which the spindle is run.

The emery wheel spindle is of steel, hardened and



EMERY WHEEL MACHINE, WARD & CO.

The machine is an adjustable gun-metal bearing. The spindle is driven by a small pulley, which is supported on two ball bearings carried in the casting of the headstock in such a manner as to entirely relieve the spindle of the pull of the belt. The tube which carries the spindle is made to slide in its bearing, so that when grinding deep holes it may be moved out the required distance, and thus support the spindle right up to its work.

The driving motion is accomplished by means of one belt, which may be driven direct from the main shaft, and fast and loose pulleys. A belt shifter enables the machine to be started or stopped without having a countershaft. The emery wheel spindle is driven from the back-shaft by two plain pulleys at the right hand end of the machine, which communicates with a drum in the body of the machine; from this an endless cotton belt drives the emery wheel spindle. This drum is carried

in a swing frame, and a screw adjustment on the foot of the machine enables the operator to put the proper tension on the belt.

The work headstock and the feed motion are driven by the two-speed cone pulleys at the left hand of the machine, and the work spindle may be started or stopped by means of a toothed clutch operated by the pedal lever at the foot.

The feed motion is driven from the shaft inside the base of the machine by an open and cross round leather belt, and the reverse clutch is placed between the two top pulleys and operated from a pair of dogs on the table. These dogs have adjusting screws, and the trip motion is sensitive, and may be easily adjusted to a very fine degree.

The machine is supplied complete with four small emery wheels of varying sizes and various accessories. The approximate net weight is 15 cwt.

Our Weekly Biography.

George Andrew Hobson, M.Inst.C.E.

MR. GEORGE ANDREW HOBSON, designer of the Victoria Falls Bridge, is a Yorkshireman *par sang*, with a training partly Scottish. Born at Leeds in 1854, he received his early education at King James's School, Knaresborough, and subsequently spent three years in Edinburgh acquiring knowledge in science and mathematics at the Watt Institute—now incorporated with the Heriot-Watt College. He returned to Yorkshire in 1871 to gain practical experience at the Tees Engineering Works, Middlesbrough. Here he became an articled pupil for a term of three years, and worked through the pattern shop and foundry, fitting-shop, bridge-yard and locomotive erecting shop, and finally entered the drawing office.

Six months before the expiration of his term of apprenticeship he was put on the paid staff and placed in charge of important work, on the completion of which, twelve months later, he was appointed head of the drawing office. This post he held for five years, during which period the designs of many works of the leading engineers of the day passed through his hands and were carefully studied. A natural taste for bridge design and construction was thereby developed, and the necessary skill and practice acquired.

At the end of the year 1880 he became chief assistant to Sir Douglas Fox and his brother, Mr. Francis Fox, and for twenty years he was actively engaged in that capacity, upon the Mersey Tunnel and Railway, Hawarden Bridge, Liverpool Overhead Railway, Great Central Railway, and numerous works in India and the Republics of Argentina and Colombia. Since the beginning of 1900 he has been, and he still remains, their

partner, the firm being styled "Sir Douglas Fox and Partners."

"Hobson's Patent Flooring" was the result of his successful attempt to solve a difficult problem in the construction of the Liverpool Overhead Railway. Designed in a simple manner for the purpose of carrying heavy loads, it is estimated that there are upwards of 100,000 tons of this system of steelwork in bridges, piers, and warehouses in various parts of the world.

In 1900, on the completion of the extension to London of the Great Central Railway, Mr. Hobson contributed to the proceedings of the Institution of Civil Engineers, a paper upon the Metropolitan terminus of that line. For this paper he was awarded the Telford premium and gold medal.

Mr. Hobson's attention at the present time is centred in Rhodesia—in the development of which territory he, in conjunction with Sir Charles Metcalfe, his firm's partner, takes great interest. During the last fifteen years they have engineered in that country two thousand miles of railway and concomitant works.

In recent years Mr. Hobson has carried out, for Mr. William Waldorf Astor, extensive works upon an estate in Kent, and he has been much consulted by proprietors and architects throughout the kingdom upon the internal construction of theatres. Though his work confines him almost entirely to London, Mr. Hobson has found opportunities to travel in Russia, the United States, Canada and South Africa. Mr. Hobson is an occasional contributor to the technical press, and he is a member of two of the Engineering Standards Committees.



GEORGE ANDREW HOBSON, M.INST.C.E.

The Sinking, Development, and Underground Equipment of Deep-Level Shafts on the Rand.

By Arthur E. Pettit.

DEEP levels on the Rand are sunk in the ground in a series of steps, or levels, and are developed in a series of steps, or levels.

(1) The first row of deep levels, usually from 800 ft. to 1,000 ft. deep, at the northern boundary of the property.

(2) The second row, or deeper deeps, some 1,500 ft. to 3,000 ft. deep, at the northern boundary.

(3) The third row, or the deepest deeps, from 4,500 ft. to 5,500 ft. deep at their shallowest point.

Owing to the favourable geological conditions, there is no reason why deeper shafts still should not be sunk, provided that the grade of ore would warrant the expense of working at so great a depth.

From experiments carried out at the Robinson Deep some years ago, before the shafts were connected or the rock allowed to cool, it was found that the temperature increased 1° F. for every 220 ft., and from this it seems feasible that, with the modern methods of ventilation and cooling, an ultimate depth of between 8,000 ft. and 9,000 ft. may be reached.

In the very deep shafts to be sunk in the future it has been suggested to set out seven compartments (one pump and ladder way, 8 ft. 6 in. by 6 ft. 6 in., and six hauling compartments, each 5 ft. by 6 ft. 6 in., giving a shaft 42 ft. by 6 ft. 6 in. in the clear.

Considerable difference of opinion is displayed in the section of wood guides in use, the sizes most met with being 8 in. \times 4 in., 5 in. \times 6 in., 6 in. \times 4 in., and 4 in. \times 5 in. Although of rather large area, the 8 in. \times 4 in. section is probably the safest, as a greater amount of surface is exposed for attaching to the dividers. In the No. 2 shaft of the Robinson Deep, steel guides of 5 in. \times 4 in. outside section are used with most satisfactory results. Steel rails are also much used as guides, which is obviously necessary when the shaft goes round the curve to the underlay, the usual sections being 45 lb., 50 lb., and 60 lb. to the yard. Probably the most satisfactory way of using rails as guides is to fix one at each corner of the compartment, and attach guide wheels to each corner of the skip. This, again, is not perfect, however, as, taking into consideration the high velocity which a skip runs at in a deep-level shaft, it would not be economical to let a wheel run loose on a trunnion fixed to the side of a skip; the wheel should preferably be shrunk on to an axle, which necessitates bearings on the top of the skip, and so throttles the dumping opening of the skip. Although not at present attempted, a solution to the difficulty would probably be found in hanging the skip in such a position in its frame that the bottom wheels tend to cling to the rails, and in using shoes, lined preferably with sections of raw hide, on the top of the skip to prevent the skip leaving the guide rails.

Cost and Rate of Sinking.

Truscott refers to the various costs and rates of sinking, and by taking some of his figures and extending them we get the following table:

It will be seen from these figures that it is apparently no more expensive to put down a large shaft than a small one. It is probable that if the size of the shaft is increased beyond 28 ft. by 8 ft., the rate of sinking will decrease with the increased area. In

the future it may prove economical to use two hoisting engines to remove the dirt, as the rate of sinking depends mainly on the speed with which the dirt is removed.

Ore Bins.

After the initial stage of development, when it is probably more economical to handle cars in cages, especially before the ore bins are completed, all rock is handled from ore bins, such bins being of various shapes and construction, but usually large enough to carry a considerable reserve of ore. The position of these bins varies considerably, some mines having a bin for each level; but the more economical and the more convenient plan, although possibly more costly in original construction, appears to be to have one main loading shoot for those levels on the north side of the vertical shaft, which are connected to the shaft by cross-cuts, and one loading station for every two levels on the incline.

Every variety of ore bin door has been tried up to the present, but the most satisfactory arrangement is some modification of the doors and shoots used at Kimberley; that is to say, filling a small shoot equal in capacity to that of the skip in use from the main ore reserve, and allowing the whole contents of this small shoot to run into the skip. Fig. 1 shows one of the more recent arrangements for a deep-level shaft connection between the vertical and incline.

Vertical Shaft			
No.	Area	Perimeter	Cost
1	28 x 8	81.4	1.4
2	28 x 8	81.4	1.4
3	28 x 8	81.4	1.4
4	28 x 8	81.4	1.4
5	28 x 8	81.4	1.4
6	28 x 8	81.4	1.4
7	28 x 8	81.4	1.4
8	28 x 8	81.4	1.4
9	28 x 8	81.4	1.4
10	28 x 8	81.4	1.4
11	28 x 8	81.4	1.4
12	28 x 8	81.4	1.4
13	28 x 8	81.4	1.4
14	28 x 8	81.4	1.4
15	28 x 8	81.4	1.4
16	28 x 8	81.4	1.4
17	28 x 8	81.4	1.4
18	28 x 8	81.4	1.4
19	28 x 8	81.4	1.4
20	28 x 8	81.4	1.4
21	28 x 8	81.4	1.4
22	28 x 8	81.4	1.4
23	28 x 8	81.4	1.4
24	28 x 8	81.4	1.4
25	28 x 8	81.4	1.4
26	28 x 8	81.4	1.4
27	28 x 8	81.4	1.4
28	28 x 8	81.4	1.4
29	28 x 8	81.4	1.4
30	28 x 8	81.4	1.4
31	28 x 8	81.4	1.4
32	28 x 8	81.4	1.4
33	28 x 8	81.4	1.4
34	28 x 8	81.4	1.4
35	28 x 8	81.4	1.4
36	28 x 8	81.4	1.4
37	28 x 8	81.4	1.4
38	28 x 8	81.4	1.4
39	28 x 8	81.4	1.4
40	28 x 8	81.4	1.4
41	28 x 8	81.4	1.4
42	28 x 8	81.4	1.4
43	28 x 8	81.4	1.4
44	28 x 8	81.4	1.4
45	28 x 8	81.4	1.4
46	28 x 8	81.4	1.4
47	28 x 8	81.4	1.4
48	28 x 8	81.4	1.4
49	28 x 8	81.4	1.4
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67	28 x 8	81.4	1.4
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79	28 x 8	81.4	1.4
80	28 x 8	81.4	1.4
81	28 x 8	81.4	1.4
82	28 x 8	81.4	1.4
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86	28 x 8	81.4	1.4
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88	28 x 8	81.4	1.4
89	28 x 8	81.4	1.4
90	28 x 8	81.4	1.4
91	28 x 8	81.4	1.4
92	28 x 8	81.4	1.4
93	28 x 8	81.4	1.4
94	28 x 8	81.4	1.4
95	28 x 8	81.4	1.4
96	28 x 8	81.4	1.4
97	28 x 8	81.4	1.4
98	28 x 8	81.4	1.4
99	28 x 8	81.4	1.4
100	28 x 8	81.4	1.4

Signals.

equipped, the choice lies between three different classes of signals: (1) Straight-pull bell wire, (2) electric, (3) pneumatic.

For vertical shafts a straight-pull signal, actuated usually through a $\frac{1}{8}$ -in. or $\frac{1}{4}$ -in. bell wire, balanced at suitable intervals, especially with a return signal of the same class, is very hard to improve upon; but as the incline increases in depth the friction on the wire becomes too great, and the whole service unmanageable.

Electric bells in deep-level shafts have not up to the present given very satisfactory results, and the maintenance has been very high. The United Engineering Company have recently brought out a most complete set of bells and station indicators, the bells and pushes being so designed that it is practically impossible for water to get at the vital parts. Although rather high in initial cost, this is probably the best system in the market. Pneumatic signals worked by compressing a piston, and so blowing a whistle, have been tried, but, although good enough for short distances, are not trustworthy for great depths.

Pumping.

The small quantity of water usually met with in deep-level shafts, apparently rather decreasing than increasing as greater depths are reached, does not call for a very large pumping equipment. Water is raised either by pumps (Cornish or electric) or by bailing tanks. The first row of deep levels are, as a rule, equipped with Cornish pumps of the ordinary type, and of a capacity equal to the estimated quantity of water. The ordinary arrangement of pump rods, bobs, and general equipment is followed in the vertical, and in the incline the rods are either carried down the slope and used in compression, or a steel rope is fixed to the end of the pump spear, and, passing under a sheave wheel, has a sufficiently heavy weight at the end supported on a carrier to work the pump plunger. The usual lift for these pumps is about 300 ft.

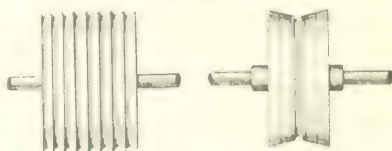
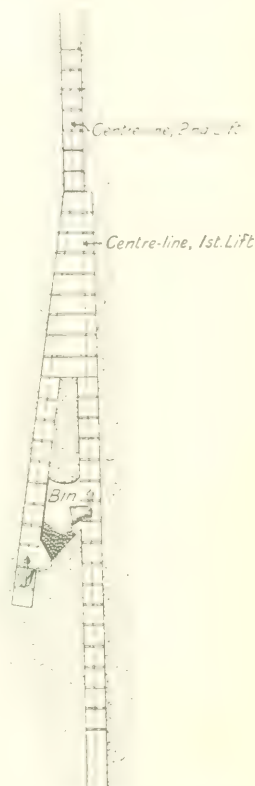
The maintenance on this class of pump is high, and the efficiency not all that can be desired, although this latter defect would probably be improved by increasing the stroke. A Cornish pump, moreover, takes up too much room in a shaft.

Electric pumps are generally finding more favour, especially as depth increases. They do not require so much room in a shaft, and, although higher in initial cost, do not require so big an expenditure in maintenance. High-tension current up to 3,300 volts is taken underground, and there transformed down to 110 volts, and, owing to the excellence of the cable used, there is no danger from the high voltage employed, and the initial cost is considerably reduced.

Three-throw plunger pumps, with pump barrels 6 in. in diameter and of 8 in. stroke, connected to 50 h.p. three-phase induction motors, working through cut gearing with a motor speed of 450 revolutions per minute, running the plunger crank shaft at 60 revolutions per minute, and pumping against a 500 ft. head, seem to be generally held as the best, although in some shafts high-lift pumps of the following description are being installed:—

Germania triplex single-acting Riedler pumps, $\frac{1}{2}$ in. plungers, 15 in. stroke, capacity 500,000 imperial gal. per twenty-four hours, geared to 175 h.p. Brown-Boveri three-phase induction motors, to work against a 1,300 ft. head. By the use of such high-lift pumps considerable expense is saved in cutting chambers, which usually average some £3 to £4 per cubic yard

excavated, as well as the saving in the reduction of the number of attendants necessary. It is quite possible that high-lift pumps will come into vogue generally, but they will probably be fitted with ordinary suction



and delivery valves, which are far simpler, and, with due attention, can give a higher factor of efficiency.

Method of Handling Water.

Probably the cheapest method of handling water is by a long, centrally placed vertical shaft, as by means of bailing tanks, and, if the quantity of water is small and the hauling capacity available, the most satisfactory. Bailing tanks are extensively used in the deeper shafts during the development stage, and vary in capacity from 300 to 1,500 gallons. Fig. 5 shows the type found to be the most convenient.

Figures giving the cost of pumping electric and Comstock and bailing show that there is not much difference in pumping costs between the two methods, while bailing costs only about one-half of other systems.

Fig. 6 shows a method of taking the weight of the pump column off the timbers in the shaft.

Considerable delay and inconvenience is caused in having to raise and lower drills both for machine and hand drilling, and at some mines the drills are sharpened below ground, using coke or charcoal as a heating agent. The work of sharpening is very hard on the men, and therefore high-priced, and the atmosphere in the upcast shaft such that it is practically impossible for the timbermen to work or examine the shaft during the time the fires are alight.

By the use of machines of the Kimber or Lightbody type of sharpeners, driven by a motor placed below, and with the heating done with a self-smoke-consuming petroleum blast furnace, or, still better, with an electric heating furnace, all lowering or raising of drills and much inconvenience and delay could be avoided.

Abstract of paper read before the Institution of Mining and Metallurgy.

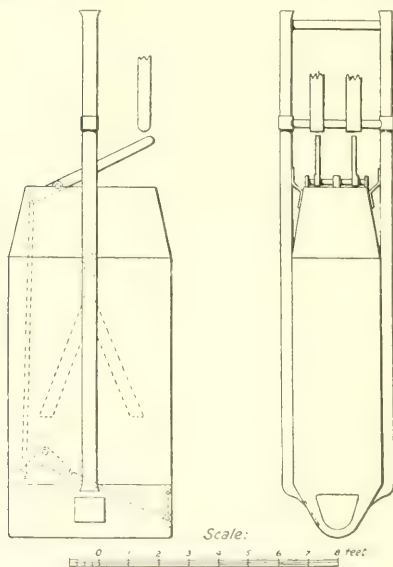


FIG. 5. BAILING TANK USED IN DEEP LEVEL SHAFTS.

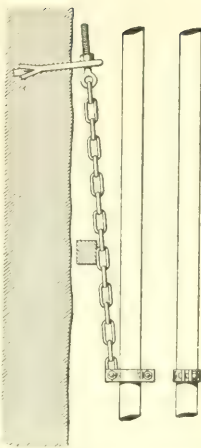


FIG. 6. METHODS OF SUPPORTING PUMP COLUMN IN DEEP LEVEL SHAFTS.

York Meeting of the British Association.

The arrangements for the seventy-sixth meeting of the British Association, to be held at York in August, are now in an advanced stage. The President-elect is Professor Ray Lankester. The President of the Engineering Section will be Professor J. A. Ewing, director of Naval Education, the vice-presidents being Sir Colin Scott Moncrieff and Mr. W. Cudworth. It is proposed that the Association's new medal "for achievement and promise in scientific research in South Africa" shall, as far as circumstances will allow, be awarded annually. The movement was inaugurated in connection with the Association's visit to South Africa last year, and at the present time a sum of upwards of £1,500 is available for the endowment of the medal and a scholarship. The report of the Executive Committee, which is to be submitted to the subscribers at a meeting summoned for March 2nd, recommends that the South African Association for the Advancement of Science be entrusted with the disposal of the medal and income of the fund. The medal will be 2 in. in diameter and will be struck in bronze.

Trades Union Statistics.

MR. JOHN BURNETT, the Chief Labour Correspondent at the Board of Trade, has gathered in one volume, which has just been issued, all the detailed statistics referring to Trade Unions for the three years 1902-04, with comparative summary tables going back to 1895. At the end of 1904, there were in existence, so far as was known to the Labour Department of the Board of Trade, 1,148 separate workmen's trade unions with a total membership of 1,866,755.

The British Engineering Output.

(As seen through American Spectacles.)

THE United States Commissioner of Labour has recently completed his eleventh special report on the Regulation and Restriction of Output relating to a number of trades in the United States and Great Britain. Dr. John H. Gray, who collected the data for England, found his task rendered difficult owing to our alleged "secretiveness."

General Engineering.

Some of the matter seems a little antiquated, and the Commissioner is apparently loth to enter upon general conclusions, but as regards the intensity of restrictions, distinguished from their extent, he is satisfied that such extreme cases have not been found among trade unions in the United States as in Great Britain. In the section devoted to general engineering, Dr. Gray, in effect, tells us that we need more organisation and machinery, and less jealousy and mistrust as between employer and employee. A limitation by the formal rules of the union of the amount of work to be done by individual workmen has practically disappeared, but "one cannot get the honest views of the English employers or their workmen in an industry, nor can he see the correspondence that takes place, or even sit in the offices at the works, without feeling that the industry is virtually in a deadlock, and that neither side is likely to give in until there is a larger basis of common knowledge as to the condition of the industry. In view of the international competition, one cannot but feel that the employers are paying about as much to-day as they can afford to pay for the amount and quality of labour they are now getting as long as it is applied with the present tools and under existing conditions. On the other hand, the more the observer sees of English life the more he is convinced that, in view of present standards of living, and the general level of prices, the English workman does not have a sufficient wage to enable him to give his children that amount of education which will make them highly efficient workmen. The problem is to create such a degree of mutual understanding as will induce the working men with greatly improved machinery and better methods and organisation of work, to produce enough, without injury to their health, to give the employers the necessary profit and at the same time enable them to pay their employees a total wage very much in excess of that paid to-day."

"It would be unfair to assume that under the intense strife of the last seven or eight years the employers have learned nothing, or to pretend that there have not always been notable exceptions among the employing class. But the more the subject is investigated the more one comes to feel that, broadly speaking, the employers are struggling to change the methods of pay and work, with a view to cutting down the labour cost per unit of product, and that, viewing the experience of these years as a whole, the piece price has actually been largely used, as working men allege it has been and will be used, to demonstrate

the fact that the working men are not working as hard as they can, and, when this fact is fully demonstrated, the piece price will be abolished and the men put back to keep up the pace established under the piece-price system."

Dr. Gray endeavours to show that the engineering industry is very much below the highest possible efficiency, and that under present conditions, English working men are turning out very much less product than they are capable of doing without any injury whatever to their health or social welfare. The difficulty of making changes in the industry are fully recognised.

Effect of New Machinery.

The question of introducing and manning new machines is referred to at some length. "The working men are always suspicious, and are inclined to believe that they are likely, under any change of importance in regard to machinery, to get less per unit of effort put forth (although they may get more per week, per day, or per year,) hence they are becoming more and more insistent on being consulted beforehand in regard to the introduction of new machinery, the extent and method of its use, and above all, the amount of pay to the operator. While one discovers this suspicion and mistrust of what may happen should the machinery be changed or improved, he recognises that the knowledge is gradually permeating the English working world that, whether they will or not, improved machinery will eventually be introduced into English shops. Therefore, the tendency is for controversies over the machine question to become less frequently a question of one man tending more than one machine, and things of that sort, and more frequently a question of the rate of pay to be received under the new conditions, which, as such, the workmen are opposing less and less."

Wages.

"The system upon which wages are based constitutes at present by far the most burning question in the minds of employers and employees in this industry, and is the one on which each side seems most tenacious of its own views. The consequence is that so far there has been no very general introduction of the piecework, bonus, or premium systems in this industry. Where one finds a growth of any of these systems of payment it is usually applied to non-union workmen, to unskilled labour, and to those who have not completed their apprenticeship. The employers believe that some one or a combination of these methods is absolutely necessary to enable them to do business at a profit. They are almost unanimous in the opinion that, with the increasing pressure of foreign competition, they cannot maintain their position without reducing the cost of labour, and that the only hope of reducing the cost of labour is to utilise their machinery and fixed capital to a larger extent by turning out a larger pro-

unit of product. On the other hand, the workmen believe that there is a large surplus product now, and that the industries, therefore, can maintain themselves with the present output and the present labour cost. Their most fundamental tenet of faith is that they are giving sufficient labour for the wages received, and that they ought to oppose first, last, and all the time any proposition which looks toward reducing, directly or indirectly, the amount of wages per unit of product at their expense. A leading employer in the federation said: 'We nearly all feel that the wages paid per unit of product are too high. We are opposed to any method of piece price arranged on the basis of giving as much per unit as we do now. We are agreed that the best method of reducing the labour cost per unit of product is the bonus system, which we propose to force the introduction of, even if the attempt to do so brings another strike and lock-out such as that of 1897.' He seemed to voice the general sentiment of the employers on this subject."

Hours.

"It never ceases to be a marvel to an American, says Dr. Gray, "to see English working men, even in the dead of winter, nominally beginning work at 6 o'clock and working usually two-and-a-half hours before they stop for breakfast. One is shocked at it, first, because it means getting up so early in the morning that the working man can have but little family life. In the next place, it is generally considered that a working man is not in condition to do his best work when he has had nothing to eat for twelve or fourteen hours. Viewed from the standpoint of the employer, the loss seems very great, inasmuch as the added expense for light and heat, and the added trouble of superintending the shop so many more hours a day are placed upon him. The light, the heat, and the power required for a given number of hours' work are very much greater than if work began later in the morning and ran continuously until dinner time. It took a considerable time to find out why this antiquated system still continues, and the explanations in the first instance were somewhat amusing. The workmen usually insisted that it was physiologically impossible for a man to work four and a half hours without something to eat. Whatever may have been the justification for stopping the works for breakfast in earlier generations, when the working hours were very much longer than at present, it is a well-known fact that there is no economic justification for the practice to-day, and both parties realise this fact perfectly."

"In the conference which settled the great strike of 1897-8 the truth came out very clearly. Both parties really want what is known as the "one-break system," that is, they want the works to run continuously from the time they start in the morning until the time they close in the afternoon, with but one stop for dinner. The unions regard the present arrangement as hard and unsatisfactory, but they believe, and perhaps correctly, that the cost in trouble and money to the employer of stopping for breakfast is greater than the cost to the workmen. They refuse, therefore, to yield to the employers' preference for the one-break system until the employers consent to give them specific compensation. The form of compensation they demand is a shorter working day."

Apprenticeship.

Dr. Gray has a good deal to say upon the apprenticeship question, and it is remarked that the methods of modern business tend more and more to minimise the importance of apprenticeship:—"Formal indenture of apprentices is becoming less and less frequent, and being relegated more and more to the country districts and to the industries which require extensively hand labour and hand tools. Working men, realising that their position is strong in proportion as they can maintain a monopoly of the labour in the industries in the locality, look with great alarm on the abolition of formal apprenticeship, insisting almost universally that they, having served their apprenticeship, have a vested interest in their trade. However, with the growth of general education, and especially technical education, and with the rapid development of machinery which becomes more nearly automatic, the amount of skill and training required to become a good workman is growing less, and good results are coming to depend more on quickness and accuracy of intellect and less on mere routine manual manipulation. The consequence is that in nearly every one of the internationally important trades the labour unions have had to give up any general formal agreement limiting the ratio of apprentices to journeymen. The most that they can attempt to do to-day is to demand of the employers a list of apprentices or learners, and to bring complaint and remonstrance if the number seems greatly in excess of what has been traditional in the trade in that locality. In view of the bitterness of the unions on this point, they succeed in making themselves some what troublesome to the employers by taking the position, which they hold rather consistently, that they are paid for the application of their own skill and industry and not as teachers or tutors to the unskilled boys about them. Therefore they are, more and more, making the position of the learners in the shops a disagreeable one by refusing to give them any attention or to show them how to use the tools or do their work."

If at this point a better understanding and more cordial relation existed between the union men and the employers, the amount of work turned out with a given labour force would be greatly increased. Where the union men believe that an employer has an unfair number of unskilled workmen they have it in their power to retard very greatly the amount of product turned out in the shop, and where the union is well organised and virtually in control of the shop, it can be made extremely difficult for boys to learn the trade, and many of them are doubtless sent into the trade less well prepared than would otherwise be the case. The other side of this is that when it feels the pressure of the competition of boys' labour, and finds it impossible in practice to limit their number, the union is more and more ready to admit the boys to membership and to insist that they be paid the standard or union rate of wages. The increasing willingness to take unskilled workmen into the union is the chief characteristic of the new unionism, but it is much less prevalent in England than in the United States. The difficulty of the employers in finding men with an adequate knowledge of the trade is so great as to be a powerful factor in stimulating the demand for taking up trade instruction in the schools."

Our Review of the Week.

From Our Own Correspondents.

Scotland.

GLASGOW.

Iron and Steel Industries.

Business appears to be summed up in the statement that while there is plenty of work, and new orders show a decided tendency to drag. Ironmasters now recognise that fresh inquiry is not what it was, and are of opinion that it is not likely to alter materially for the better so long as the warrant market continues to show signs of instability. At the same time they feel that consumers have little or no stock to draw upon, which confirms them in the strong front that they present in the matter of prices, on which they are not at present making any concessions. They are still quoting £7 2s. 6d. per ton for iron bars, and £7 7s. 6d. per ton for steel ship plates. The pressure for delivery of plates is quite noticeable, and ship-builders are experiencing difficulty in getting contracts fulfilled, while makers of angles although working at somewhat less pressure, are still full of orders. It is the fact, however, that the majority of these orders were placed before the last advance in prices was made at the beginning of February, and little new business has yet gone on to makers' books. The outlook in the ship-building trade is so favourable, however, that new orders will have to be placed at the higher prices immediately, and it looks as if Scottish steel trade will be busy for some time to come. It may be pointed out that this pressure of home orders has apparently led to a little slackness in securing export business, and foreign competitors have latterly stepped in and taken one or two contracts which were expected to be placed there. On the other hand, orders for malleable iron for Canada have been placed in Glasgow, and further contracts are on the tapis. The state of the engineering trades is generally favourable; marine, and motor-car, and general engineers being well employed, while locomotive engineers are making such additions to their works as suggest the belief that their output is to be fully tested. The coal trade remains satisfactory.

New North British Railway Dock.

THE HOUSE OF LORDS. Mr. R. G. Wemyss, of Wemyss Castle, promoted a Bill for the construction of a dock at the old fishing town of Buckhaven, Fifeshire. The House of Lords threw out the Bill on the ground that Mr. Wemyss had certain agreements with the North British Railway Company. After this decision a meeting of shipowners and coal exporters was held in Glasgow, at which a deputation was appointed to wait upon the North British directors and impress upon them the necessity for increased dock accommodation at Methil.

At Wemyss Castle, the Bill was introduced in the district, and since the Glasgow meeting, negotiations

and Mr. Wemyss, with a view to fixing a site for a new dock. The railway company have resolved to construct a dock at or near Methil at a cost, it is believed, of nearly £500,000. The details of the scheme are not yet adjusted, but the site is likely to be on the east side of the existing dock. The Buckhaven and Thornton Railway, and probably

Shipbuilding Returns.

A considerable falling-off for February in the output of new shipping in Scotland, as compared with the previous month, is revealed in the statistics now issued. Altogether twenty vessels of 35,300 tons were put into the water during the month, or about 8,000 tons less than in January. Nor have the bookings of new work kept pace with the output, the tonnage ordered during the month being reckoned at about 25,000. On the whole, however, the trade position is regarded as satisfactory, although there are suggestions of prospective labour troubles. Of the seventeen vessels launched from Clyde yards, seven of 10,155 tons were built in Port Glasgow and Greenock, two of 7,470 tons in Partick, while the remaining 12,003 tons is made up by single ships from different yards in other parts of the district.

Gas Motors for Launches.

Some particulars are now forthcoming with regard to Messrs. Beardmore's gas motor launch, *Dalmuir*, which is making a trip on the Forth and Clyde canal. We believe we are correct in stating this is the first launch in Scotland to be fitted with marine gas-engines. These are on the Beardmore-Capitaine principle, and, while still in the experimental stage, a great deal is expected of them. The plant includes a gas producer, in which ordinary anthracite coal is used, the consumption being a little over 47 lb. per hour. The engine is of the four-cylinder type, working up to 300 revolutions per minute. The cylinders are 8½ in. diameter and 11 in. stroke. The producer is worked by petrol engine, which also starts the main engine. On leaving the producer the gas enters a cooling tower, with water sprays inside. Then it proceeds to a centrifugal drier, and from thence to a mixing valve, from whence it is taken to the engine.

Naval Construction Orders.

The estimates show that the Clyde takes a larger sum than any other district. The amount for work already ordered from shipbuilders and engineers in

COMPANIES, WITH £37,000 in the previous year. The latter company heads the list with an amount of £665,000. The second place is taken by the Vickers Company with £610,862, but the latter firm profits not only by orders for gun mountings and projectile at Barrow, but for armour and guns and electrical equipment from their Sheffield works. The third place is taken by Messrs. John Brown and Co., Ltd., who will earn for their Clydebank establishment alone £588,762.

Shipbuilding Labour Crisis.

The votes of the members of the trade unions affiliated to the Federation of Shipbuilding and Engineering Trades and the General Federation of Trade Unions on the question of striking in order to enforce the weekly payment of wages in the Clyde district were counted on Saturday in the offices of the Associated Ironmoulders of Scotland, St. Vincent Place, Glasgow. Although the actual figures are not published, it is stated that there is an overwhelming majority in favour of taking extreme measures to obtain this concession. A joint communication has been sent to the Clyde Shipbuilders' Association and the North-West Engineering Trades Employers' Association asking for a conference, and suggesting as suitable dates the 26th and 27th of this month. At that conference the men's delegates will be in a position to give the exact result of the voting and to discuss with the employers the question of what further action may be taken. There is, how-

ever, a strong probability that at the conference proposed by the men's representatives a compromise will be arrived at which will render a stoppage of work unnecessary.

Lloyd's Register Dinner.

The annual dinner of the Scottish staff of Lloyd's Register was held on Saturday last at Glasgow, under the presidency of Lord Inverclyde. In proposing "Lloyd's Register" Mr. James Mollison chief engineer, gave an interesting retrospect of marine engineering. In the latest developments, he said, not only was the steam turbine rapidly taking the place of the reciprocating engine particularly for fast passenger vessels, but there was every probability that in the near future the gas engine, with producer gas, would fill an important place in marine propulsion. Lord Inverclyde drew attention to the fact that fifteen turbine steamers of 50,000 tons, already launched by United Kingdom builders, were classed by Lloyd's. The vessels now building in the United Kingdom for the classification of the various societies amounted to 1,105,668 tons. Of this 690,400 tons were intended for Lloyd's classification, leaving only 205,169 tons, or 17 per cent. for all the other societies. Shipbuilders and shipowners were fully alive to the readiness of the committee to accept new ideas of construction, and to utilise the high scientific and practical knowledge of the society's staff.

North-East Coast.

NEWCASTLE-ON-TYNE.

Tyne Iron Trade.

The figures compiled by the Tyne Commission and just issued for the past year are summarised below:—

	Imports. Tons.	Exports. Tons.
Angles and bars	637	3,333
Plates and sheets	762	803
Castings	330	7,043
Machinery	2,000	6,713
Forgings	4,540	..
Iron	22,520	84,004
Steel angles, etc.	1,007	22,423
Steel billets, etc.	10,013	1,847

It will be seen that in a majority of cases the exports of iron from the Tyne exceed the imports. There is one exception that needs to be referred to. The quantity of steel billets, blooms, etc., that is brought into the Tyne is more than five-fold that exported; and unlike the pig-iron which is largely brought into the river, the billets are not brought coastwise. Most of that form of steel is brought into the river from Belgium and Holland, and whilst it gives to some manufacturers here a cheap partly-made material, it is a material that could be produced

in this country, and will probably be more largely produced in the north-eastern district in the early future.

February Iron Trade.

A marked improvement is recorded in the exports of iron and steel from the North of England during February. The shipments of pig-iron, according to the Middlesbrough Customs returns were 72,740 tons; manufactured iron, 14,435 tons; steel, 30,698 tons; the aggregate increase on January being 14,834 tons. The feature of the pig-iron exports was the large quantity sent to Germany, the reduced price of Cleveland pig having brought it into successful competition with native iron in various places near the German seaboard. More foundry iron was also sent to Scotland. Italy took 9,000 tons of hematite, and cargoes of 2,000 tons each went to the United States, Japan and South Australia. The chief customers for manufactured iron and steel in the form of railway material and bridge work were: India, 11,000 tons; the Straits Settlements, 5,000 tons; Portuguese East Africa, 4,000 tons; and Japan, 2,000 tons.

General Trade Outlook.

The iron and steel trades remain in steady work. The general trade is fairly well employed, but the smaller trades are only quiet. A welcome addition to the business of the district is the new works of the Thermal Company, at Wallsend. The huge works of Armstrong are also well employed in some departments, whilst the fact of this firm transplanting a quantity of machinery to their Italian works at Pozzuoli gives reason to fear that a large number of hands will be dispensed with, which will be a grave misfortune for this district. In their motor departments they are well employed: having received recently, in addition to considerable orders on hand, an order for about 200 motor buses.

Trade of the Tees.

Sir Hugh Bell, who presided at Monday's meeting of the Tees Conservancy Commissioners, said that the past month had been a remarkable one in connection with the trade of the river. They had had a larger number of vessels than in any previous month, both loading and discharging. Notwithstanding the volume of trade in their iron and steel industries there had been signs of "flagging" in prices. He would point out, however, that the absolute prosperity of trade was not always to be gauged by the prices. It was disagreeable for the ironmasters to have to accept smaller sums for their products, but it was nevertheless an advantage to the district when they were able to sell a larger quantity of their goods. These fluctuations of trade should not influence the Commissioners in the large policy they had in view. The policy of deepening and improving the river, providing better wharves and repairing accommodation, and bringing other trades there was based on the belief that the prosperity of the iron trade was certain, and he thought the policy they were carrying out was the right one.

Admiralty Work for Local Firms.

The Tyne work in connection with naval construction, as shown by the Estimates, is distributed amongst four firms. The Palmers Company tops the list by reason of the large instalment for progress with the hull and machinery of the new battleship *Lord Nelson*—the only work they have on hand. The amount to be credited to Sir W. G. Armstrong, Whitworth and Co., Ltd., approximates pretty closely upon half a million, exclusive of the ordnance work done at Elswick and Openshaw, Manchester, where also armour plates are made. The Elswick shipbuilding vote is made up of a final instalment for the cruiser *Achilles*, £320,000 for the hull of the new *Invincible*, and a large instalment for the thirty-three-knot destroyers. Messrs Hawthorne Leslie's total is due to the machinery of the *Achilles* and the *Agamemnon*, and to torpedo craft including a 33-knot destroyer and the

machinery for the Elswick boat of the same class. The completion of the machinery of the *Warrior*.

Shipbuilding on the Wear.

The shipbuilding on the Wear at Sunderland during the past month was nine, aggregating 25,120 tons. This makes a total for the two months of the present year of eleven vessels and 32,400 tons, against thirteen vessels and 41,398 tons for the first two months of 1905. In February of that year the output was 14,000 tons, and in January 12,400 tons.

Extensions at Smith's Dock.

Messrs. Smith, Nephew & Sons, Shipbuilders, which was closed last autumn to allow extensive alterations to be carried out was re-opened last week. The utility of the dock, built in the days of narrow ships, was very much limited for want of breadth and depth. The alterations consisted of widening the head, renewing and deepening the bottom, and rebuilding the entrance. The quoins and sill are in Aberdeen granite, the new work being of a substantial nature. Messrs. Smith have carried out the work with their own staff, under their engineer, Mr. Edward Box. The dock as altered is 410 ft. long, by 30 ft. 6 in. wide at entrance, and has 20 ft. depth of water on the sill. The dock is now their second largest, being exceeded only by their large pontoon.

Prospects of Shipbuilding Industry.

Sir W. Theodore Doxford, speaking at the meeting of his company on Monday last, addressed himself to the shipbuilding outlook. The future was always difficult to forecast, and he thought that this was more than usually the case at present, for although they had a fair amount of work booked, much of it was at low prices, the costs both of material and labour were increasing. What was of even more serious moment, was the fact that concurrently with the increased cost of production they had the freight market in such a wretched condition that many owners did not feel justified in contracting for new tonnage at prices which were in proportion to the increased cost. The result was that very few orders were now being placed, and builders were likely soon to be short of work, unless there was a substantial improvement in the freight market.

Doxford's Output.

Messrs. William Doxford and Sons, shipbuilders, Sunderland, who had the largest output of tonnage last year, launched during February nine vessels. In 1904 they had launched 11, and in 1903 12. This year launched one steamer a fortnight.

Yorkshire District.

SHEFFIELD.

Sheffield Heavy Trades.

Inquiry in various directions indicates a fairly satisfactory position in the iron and steel trades, and both makers of pig and finished materials appear to have plenty of work on hand. For certain descriptions of finished material there is some difficulty in obtaining deliveries as promptly as desired. In almost all descriptions of steel bars an excellent business is being done, especially by firms who trade with foreign markets. The weight of steel that is being manipulated for use in the older industries of Sheffield is still disappointing. Merchants in Swedish irons and steels report that they are experiencing a well-sustained demand, and that there is less difficulty in obtaining the supplies they need. The Continental and American consumers bought largely last year, and the exports from Sweden reached a record figure. The stocks of Swedish material held in Sheffield are fully up to the average, and prices are firm. There is an increasing demand for steel for motor-car manufacture, and it is an indication of the trend of affairs that the Brotherhood Crocker Company are about to erect works at Tinsley.

Machine Tool Trade.

The tool making industry is doing a steady trade. Among special work the combined duplex boring, planing, and facing machine by Miley's Machine Tool Company, Ltd., Keighley, may be referred to. A lathe for reducing both the ends of ship ladder rungs at once has been recently built by Carter and Wright, of Halifax. The straight bed is 4 ft. 6 in. long, 9 in. wide, and 7 in. deep, and forms a tank for the lubricant, the two standards being of cabinet type. The lathe will admit rungs up to 2 ft. 6 in. long, and has two headstocks, one stationary and the other movable along the bed by means of rack and pinion, and provided with a locking bolt. The two spindles are of steel, and have 1 in. holes right through. They are driven by 8-in. flanged pulleys, 3 in. wide, running in parallel gun-metal bearings. The spindle nose is bored out to No. 2 Morse taper, and screwed at the front end, and also provided with stop plates. The spindles are operated by steel racks and quadrant levers, the latter being attached to their ends.

Electric Driving of Machine Tools.

A paper on this subject has been read before the Sheffield Society of Engineers and Metallurgists recently by Mr. Ellis. Referring to high-speed cutting, the author said when electric driving was first introduced 25 h.p. for a single lathe was regarded as ample; to-day heavy lathes with only this power would not remove the amount of material which a high-class tool steel was capable of removing. Consequently, new lathes with 40 to 50 h.p. motors

attached, were being ordered, and quite recently he had heard of a case of a 50-h.p. motor being applied to a single lathe. He suggested the grouping of three or more machines with an 80 or 100-h.p. motor as an advisable arrangement for all but special work.

Railway Order for Leeds.

The managing committee of the South-Eastern and Chatham Railway have placed with Messrs. Kitson and Co. a contract for six steam motor-rail vehicles, each of which will afford comfortable accommodation for fifty-six passengers. These motors, even when hauling a trailer coach, weighing sixteen tons, will attain an average speed of thirty miles an hour.

Cast Iron in the Foundry.

Mr. Percy Longmuir read a paper on this subject before the Sheffield Society of Engineers and Metallurgists, on Monday evening last. The lecturer laid down the initial composition of the cupola charge as one of the first essentials of practical iron founding, and named as the other two the melting and pouring at a suitable heat of the mixture into a properly formed mould. These three fundamental essentials, mixing, melting, and moulding, opened out, he said, a wide field for discussion, and he could only touch very generally some of the more salient aspects. The average iron casting is judged by one or a combination of the following factors: (1) general appearance and truth to pattern; (2) ease of machining; (3) the properties of test bars attached to the casting; and (4) resistance offered to the percolation of water or steam. Each stage in the production of a casting has a decisive effect on one or other of these factors; and these stages the lecturer described as "determining conditions," in that they determine the success or otherwise of any casting. The more important conditions are (1) composition of the charge; (2) the mould and its cores; (3) method of melting; (4) casting temperature; (5) the presence of foreign matter, sand, slag, or blowholes; (6) shrinkage or contraction.

Laws Governing Production.

Mr. Longmuir discussed ironfounding under these several heads, and the attention of his audience was directed mainly to the composition of charge—this section enabling Mr. Longmuir to go very fully into the mechanical properties of cast irons of varying chemical and metallurgical compositions. The main part of the lecture was, in fact, devoted to the micrographic structure of cast irons of different compositions exhibited by means of magnified sections on the lantern screen. Statistical tables were exhibited showing how the mechanical properties differ as the composition is varied.

... of a phosphorus and silicon content in the cast iron varies. He laid great stress on the fact that the laws governing the production of castings which are deducible from these observations, if foundry work is to be successful, and exhibited types of suitable compositions for specific purposes, such as malleable cast, chilled grey-iron, high-pressure cylinders and valve bodies, machine and engine details and gearing, soft-engineering and millwright castings, stove-grate and similar work, and hollow ware. Practically, he said, the keynote of success in composition was silicon control. Given the right silicon, a suitable ratio between combined and free carbon will follow, provided cooling is normal; and the influence of sulphur, phosphorus, and manganese is of secondary order. The silicon content should vary for the above specified purposes from 0.4 per cent. for malleable, to 3 to 3.5 per cent. for hollow ware.

New Dock Schemes at Hull.

The Hull Corporation has approved the proposed new pier and wharf to be erected by the Hull Corporation at an estimated cost of a quarter of a million. It was agreed that the scheme should be referred to the Corporation Bill, which is to be introduced at the Albert Dock promenade was sufficient to meet the requirements of the city, and that representatives of the Chamber of Commerce should be invited to the Corporation Bill, and give evidence against the scheme. A letter was read from the Hull and Yorkshire Railway Company assuring the Council that the scheme for the extension of the company's quay at the Albert Dock would be completed before the end of the present year. The scheme would provide a quay 100 ft. wide, and a shed 100 ft. wide, and shedding to the same extent.

Lancashire District.

MANCHESTER

The Iron Market.

In the Manchester market prices have not followed warrants to the full extent, but have nevertheless weakened considerably during the month. The following table, which is published by the Manchester Guardian, will show the various movements in pig-iron:—

	Best	1st	2nd	3rd	4th	5th
Jan. 30	0.63	0.61	0.62	0.60	0.58	0.56
Feb. 28	0.61	0.59	0.60	0.58	0.56	0.54

The case of Lancashire iron—which remains nominally at the same price—is pointed to as being peculiar. There is but little of it, and the makers are well able to wait for their market. Nevertheless, while the price on January 30th was a real value, that on February 28th is merely nominal. The enormous change which has taken place in the relationship between Cleveland and the other makes of foundry iron is noticeable. Temporarily, makers of these other classes can no doubt keep the prices fairly steady, but unless relief comes to them in the form of a rise at Middlesbrough it is obvious that they must soon take steps to meet the market.

Naval Shipbuilding Contract.

Two of the dozen new submarines are to be built, it is said, at Chatham. Evidently, therefore, ten only are to be of the Holland type. These, Messrs. Vickers, Sons and Maxim, Ltd., will build at Barrow. The turbine machinery for the dockyard built armoured ships will also be contracted for. Humphrys, Tennant and Co., who are making the turbines for the Elswick *Invincible*, are almost certain to get the machinery for one; and Vickers, Son and Maxim ought to be strong competitors for the other contract.

New 7½-in. Lathe.

Attention may be directed to the new high-speed 7½-in. centre-sliding, surfacing and screw-cutting lathe, by Messrs. G. Birch and Co., of Salford. The principal feature of the machine is the all-gear headstock, which is driven by a constant-speed belt, and which therefore gives practically constant power at the nozzle. The driving pulley is 12 in. diameter, by 3½ in. wide, running at 300 revolutions a minute. The gearing is arranged to give sixteen speeds in geometrical progression from 10 to 450 revolutions a minute. The mandrel has a 2-in. hole right through it, this enabling a large variety of work to be turned from the solid. The front bearing is 3½ in. diameter by 4 in. long. The lathe is made with either gap or plain beds as required, the bed having a square guiding surface. About 100 lbs. weight.

New Mersey Dock Offices.

For this building, now in course of erection, in Liverpool, the claim is made that it will be the largest purely commercial building in the county. The extreme dimensions of the building are 264 ft. by 216 ft., and from the street to the cornice is 80 ft. The chief feature is the fine dome, 220 ft. in height from the street level. Flanking the entrance to the Central Hall will be two figures representing "Commerce" and "Industry." The cost of the building is £300,000.

Furness Railway Compensation.

The Barrow Town Council meeting has decided to pay the Furness Railway Company £30,000 compensation for the loss of the railway bridge across Walney Channel.

The Midlands.

BIRMINGHAM.

Birmingham Iron Meeting.

The iron market at Birmingham did not yield any additional business on that of the preceding week. The tone was firm, however, and the feeling entertained was that before the end of the present month there must be a recovery of demand, as most people are working at their stocks, which in most cases are getting bare. The finished iron manufacturers experience a slow business, but it is sound. Bar-iron makers have enough work for the coming month, though all the specifications are not in. Small angles and flat and round bars for hurdle fencing are in better demand. There are good inquiries for steel, makers in the district being very busy on wagon and structural contracts. Bars, angles, channels, and plates are reported to be heavily sold. Small ingots are wanted for other districts. Staffordshire iron is firm on running contracts, and there is a strong demand for Derbyshire pig-iron, but prices are above what buyers are prepared to respond to. It was announced by one firm of Derbyshire ironmakers that the whole of the output of three furnaces has been sold to the end of July. Northampton pig-iron sales were effected at 60s., though the lots were small.

Belgian and German Competition.

It is reported that a considerable quantity of Belgian iron is being offered, and that this is rather weakening the position of local makers. Some of the smaller producers who have run out of orders are willing to accept very low prices, but the firms connected with the Association are standing out for full values. German steel has been offering at about 2s. 6d. below English prices, but delivery before June cannot be guaranteed. German sheet bars are £5 7s. 6d. to £5 10s. There is still a considerable weight of material coming in under old and low-priced contracts, and local makers are well engaged and at good prices.

Machine Tool Trade Active.

With the general iron and steel trade in a healthy state, and a strong revival in the cycle branch the tool trade, as a whole, is full of orders. In particular, turret lathes, milling machines and gear cutting machines are in regular request, and it is noteworthy that modernisation of shop practice is going on in various directions, which will maintain the demand for the newer types of machine tools. There has been a steady inquiry for nut and bolt-making machinery, while the wagon-building shops are working up to their utmost capacity, and this has called for additional heavy tools. The motor trade is responsible for the introduction of certain new machine tools, and in this direction Messrs. Taylor and Challen are breaking fresh ground. The Tangye Tool and Electric Company have in hand a number of interesting machines. Messrs. Brown and Ward have recently effected one or

two improvements in their $\frac{1}{2}$ -in. automatic wire-feed capstan lathe, one of these being the compound wire-feed locking mechanism. The Taylor disc grinder has lately been improved, and besides thread-milling appliances, a number of large tube benders, Kennedy patent, to bend 2-in. steel pipes, are being made. The J. J. Guest grinder has been improved in one or two details. A. Herbert, Ltd., are busy upon their specialities, one of which will shortly be illustrated in this journal.

Wolverhampton Trade.

Here, as elsewhere, while the iron trade is fully employed at the moment, new orders are slow in coming on. There is a disposition, however, to believe that this will right itself in the near future, owing to the limited stocks held by consumers. In common bar, a steady trade is being transacted, and for wide strip and hoops the demand is perhaps ever better; at all events, the mills engaged on these orders are running full time. Local firms have also good contracts on hand for constructive steel, more particularly for railway requirements, while mining machinery makers are full of work. There is, of course, a really good demand for cycle steel, that trade having had a new revival, and the electrical machinery trade is also well employed. A good output of pumping plant is also recorded.

Dudley District.

The engineering trades are steadily employed. Ordinary sizes of rounds, squares, and flats are in moderate demand in all qualities. Sales of best qualities of axle iron are good, and orders for guard iron are coming in regularly. Fair orders are being placed for bolt rods and nut bars, and rivet bars are in brisk demand in both iron and mild steel sorts. Bookings in ordinary cable rounds are large, but inquiries for best qualities are limited. Best shoe iron is in fairly good sale. Tire iron is in steady request, and inquiries for mild steel sorts are rather more general. Hoop lacks steadiness, and there is a slight falling-off in orders for tube strips. Half-rounds and ovals are in fairly even sale. Taper and bevil bars lack briskness, but such sections are in good request. The demand for plating and stamping bars is well maintained. Heavy bookings in special sections of angles and tees are reported for railway wagon work. The coal trade shows steady sales of fuel for works purposes.

Locomotive Contract for Stoke Builders.

A contract for twelve six-wheeled coupled goods locomotives for the Manila Railway Company has just been awarded to Messrs. Kerr, Stuart and Company, Ltd., of Stoke-on-Trent. These engines, which have been designed at the makers' works under the supervision of Mr. C. H. Fox, the consulting engineer of the Manila Railway Company,

have coupled wheels 3 ft. 1 in. in diameter, whilst the bogie wheels are to be 2 ft. 7 in. in diameter. The cylinders are 16 in. diameter by 22 in. stroke. The firebox will be of the well-known "Belpaire" pattern. The boiler will have a working pressure of 180 lb. per square inch. The total heating surface will amount to 1,057 square feet. Steam and vacuum brakes, and also hand brakes, are fitted to engine and tender. In running order, the engine will weigh forty-two tons, whilst the tender, running on two four-wheeled bogies, and having a capacity of 2,500 gallons of water and four tons of coal, will weigh an additional twenty-nine tons, so that the total approximate weight of each engine complete will be seventy-one tons.

Rating of Machinery.

The Lincoln Chamber of Commerce has been discussing the question of rating of machinery in England and Wales. It was pointed out that the urgency of the question originated through an appeal case on December 1st, when the Lord Chancellor decided against the appellant, and in favour of the assessment authorities. The result was that certain assessments were immediately increased. The question had been satisfactorily settled in Scotland, and in England a private Member's Bill had been brought forward in order to get the same law, without success. These increases, it was pointed out, were a very serious matter for all users and owners of machinery. The basis of assessment was inequitable, because English manufacturers would have to compete with Scotch manufacturers. In the next place it was only a law made by the Courts, and had never been passed by Act of Parliament; and, finally, it was not right that, in a sense, the assessment should be fixed secretly. A resolution was eventually carried to the effect that the recommendation of the Royal Commission on Local Taxation of 1803 should be made law in England and Wales, and that English machinery owners and users should be assessed on the same lines as was fixed for Scotland.

Iron and Steel Wages Board.

At the annual meeting held in Birmingham on Monday, Mr. G. Macpherson, the chairman, stated that no case of dispute had been brought before the standing committee during the year. He complained that there were far too many firms in South Staffordshire which were unaffiliated with the board, but who yet took advantage of its rulings. This was not creditable, as a number of firms outside the district were contributing to the board. Mr. W. Ancott, the Operatives' Society, agreed with the chairman in his protest against the absence of so many South Staffordshire firms from the board. The year 1906 might not pass without a strike. If the men did strike they would win, though it cost them £10,000, so that those outside had better come in and avert danger. Mr. H. M. Hingley expressed his confidence in the future of the South Staffordshire iron trade, and said there

were energetic operatives and enterprising employers who would not allow the trade to be stolen from the district. The report was adopted. Mr. Macpherson was re-elected chairman, and Mr. S. H. ...

Refrigerating Machinery.

THE ... have just received an order from Nobel's Explosives Company Ltd., for two large duplex ammonia compression refrigerating machines, with accessories, for their factory at Ardeer. The machines are to be driven by belt from gas engines.

Works Extensions.

W. and T. Avery, Ltd., of the Soho Foundry, Birmingham, are making considerable additions to their working area. Some nine years ago it was found necessary to move the whole of the manufacturing from the old premises in the city to the extensive works formerly occupied by those of Messrs. Boulton and Watt, and they are again compelled to increase their workshops. At the foundry, it was some little time ago found necessary to add nearly 800 square yards to the space in order to deal with the increase in castings generally and weighbridge platforms in particular, also an extra cupola capable of dealing with eight tons per hour.

The smithy has also had extra demands, owing to the increasing orders for heavy work, connected with locomotive testers, weighbeams, for large works such as the Mersey Dock extension scheme, and this department has just had added to it over 700 square yards.

In the weighbridge department more room is also required, and in future it will occupy the whole of what is now the automatic department in addition to its present extensive workshop. The automatic department itself has made such strides that an entirely new building is being erected which will give 2,000 square yards for this particular work alone. This department deals with all machines for automatically weighing different materials, and we understand that large orders are now in hand for the new machine for automatically weighing, packing, and counting the number of sacks, ensuring absolute accuracy and obviating all hand labour, and automatic coal-weighing machines of many designs and capacities. Altogether this means an increased working area of nearly 4,000 square yards, a small factory in itself.

Extensions at Hornsby's.

We are informed that the well-known makers of oil engines, Messrs. Hornsby & Sons, Limited, of Grantham, are about to add to their extensive works, the construction of a new section for erecting and repairing oil engines. Messrs. J. E. H. Andrews and Co. (Limited), of Stockport, are the contractors for the extension of Messrs. Hornsby's works, and of Messrs. Hornsby's.

Wales.

SWANSEA.

Welsh Tinplate Trade.

The tinplate trade in Wales is all the time suffering from the effect of the protection of cutting of prices between the home works, and to combat Welsh competition. There are five works, and in spite of the yearly increasing production, these works are not able to cover the home demand. Some plates from these works are sent to Holland, Switzerland, and Austria-Hungary, where they compete with the Welsh product. German prices, however, are fixed on the basis of British quotations, prices being regulated by the syndicate which controls all the works. Opinions are divided as to the influence of the German selling office on prices and business. The works are accused of intentionally keeping production below requirements, and then there is the question of delivery. German works take from four to six months to deliver, whereas this could be done from Wales in the same number of weeks. In 1887 the Germans produced 13,800 tons, which in 1904 had increased to 47,699 tons. It is asserted that the Germans had charged 50 per cent. more than Welsh prices; yet, as shown, the Germans now increase their tariff by 3d. per box. In estimating the effect of the increased tariff, it should be borne in mind that it was already 28. 6/d. per box, and yet in spite of this the Germans have continued to be largely dependent upon Welsh plates, and the additional tariff will by no means exclude Welsh tinplates from that country.

Additional Dock Facilities.

The work of equipping the new Bute Dock at Cardiff is being pushed onward as fast as possible, and it is expected that the two movable tips now in course of construction at the bottom end of the east side will be completed at an early date. During the next few weeks the equipping of the import wharf will be commenced. It is understood that eight large modern cranes have been ordered, and that it has been decided to erect them at the town end of the west side of the dock.

A New Wye Bridge.

The building of the new bridge over the River Wye, at Brockweir, is making satisfactory progress. The bridge consists of three spans, having an opening of 70 ft. each, supported by two sets of double cylinders sunk into the water, each set being 70 ft. from the stonework on either shore. The pillars are 4 ft. 6 in. in diameter, and are divided into 6 ft. lengths. The set on the Monmouth side has been lowered some 6 ft. below the river bed, but how much deeper they have to go depends upon the discovery of solid bed rock.

Port Talbot Equipment.

The new work recently put in hand here consists of a new import wharf with a length of 100 ft.

and width of 50 ft., which is being built on the Hennebeck ferro-concrete system, the work being the first of its kind in South Wales. Another import wharf has been constructed adjoining the Rio Tinto Company's new wharf, but this wharf, at the wish of that Company, is being constructed entirely of timber. The plant includes four new hydraulic cranes by Messrs. Tannett, Walker and Co., and a new coal hoist which will lift wagons of both 10 or 20 tons capacity to a height of 61 ft. above water level. The hoist is of the direct-acting type, and is being built by Messrs. John Abbott and Co., of Gateshead-on Tyne.

The Rio Tinto Company's New Works.

The new works of this company at Port Talbot Docks have excited a good deal of interest locally, and the shipment of cargoes has now commenced. The equipment of the new works is of the most modern type, and electrical driving has been largely introduced. Two Temperley transporters have been erected, running from the wharf into the works, and tubs are now lifted straight out of the holds and carried directly into the works with their freights. The furnaces, too, are charged and discharged by the latest type of machinery for such a purpose, automatic stokers have been introduced, and large travelling cranes have been installed to convey the cradles from place to place. At present only one furnace has been put into operation, but the works will be in full swing within a comparatively short period.

New Works for Landore.

There are being erected at Landore antimony smelting works, where experimental processes will be commenced in a few weeks.

Projected New Blast Furnaces.

Messrs. Cammel, Laird and Co., who have been repeatedly reported as prospecting at Port Talbot, with a view of establishing blast furnaces there, are now said to be in negotiation for a site on the Burrows, near Swansea. The Swansea Harbour Trustees have under consideration applications for sites from a number of firms.

Future of Pembroke Dock.

An Admiralty order has been received at Pembroke Dockyard directing the despatch to other yards of nineteen new machines recently supplied to that establishment. The Admiralty further intimated its decision to divert fourteen other new machines ordered for Pembroke to other yards. This step can be taken without impairing the efficiency of Pembroke Yard as a building establishment, should it be intended to maintain it hereafter for that purpose, as the present machinery equipment is in excess of what is required.

Stoke-on-Trent.—The Corporation invite tenders for electricity meters. Borough Electrical Engineer

Wimbledon.—Supply of stores and materials for the Corporation electricity department, including cables, joint boxes, transformers, and meters

Abroad.

Antwerp.—Construction of a lock at Malines, estimated cost, £45,525. Rue des Augustins 15, Brussels

Brussels.—Works at Onoz, including threesteam engines and pumps. Compagnie Internationale des Eaux de l'Agglomeration Bruxelloise, Rue du Trône 48

Christiana.—Supply to the Norwegian State Railways for 101,850 tons of best sort locomotive coal. Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, E.C.

Egypt.—Supply and erection of an electric light installation on board H.H.S. *Aida* at Alexandria. The generating plant is to consist of a suitable engine coupled direct to a 5½ kilowatt dynamo, including switchboard, instruments, wiring, lamps, switches, fuses and ventilators. Central Office of the Ports and Lighthouses Administration, Cairo

Hulst (Netherlands).—Supply of 3,500 kilos of cast-iron tubes and 5,500 kilos of repairing joints and syphons to the Municipality of Hulst (province of Zealand). Town Hall Hulst

Johannesburg.—Supply, free, at the municipal stores, of 350 street lamp fittings, 50 staves and 600 ft. gas barrel. Town clerk

Lisbon.—Construction of iron bridge (about £1,120). Direccao de Minho e Douro

Madrid.—The Direccion General de Obras Publicas invite tenders for an electric railway project in Barcelona

Madrid.—Concession for an electric railway in Madrid. Directorate-General of Public Works

Manila.—Construction of two steel breakwaters. Harbour Works Manager

Montevideo.—Complete installation of Cerro de Montevideo lighthouse, of nine gaslit buoys, and of gas works. Ministerio de Fomento

Muenster.—Supply of electric light and power equipments to the Kuschweije Railway. Director of the State Railways

Pilsen.—The Austrian State Railways invite tenders for the electric lighting of the station in Pilsen

Pretoria (Transvaal).—Supply and erection of a refuse destructor, for the municipality. Messrs. Mosenthal, Sons and Co., 72, Basinghall Street, E.C.

Rosario.—Public electric lighting. Municipal authorities, Rosario, Argentine

Spain.—Municipality of Barcelona require a steam roller and a road scraper at the estimated cost of £850. Commercial Intelligence Branch of the Board of Trade

Last Day,

Mar. 1

Mar. 17

Mar. 19

Mar. 14

Mar. 27

April 30

Mar. 12

Mar. 11

May 21

Mar. 11

April 11

April 5

May 15

Mar. 6

Mar. 6

Mar. 15

April 16

Mar. 15

Stettin (Germany).—Supply of 3,100 tons of steam coal for the fiscal year 1906. "Kgl. Regiments-Bauhof, Stettin Bismarckstrasse 10"

Sydney (New South Wales).—Supply and erection of (a) boilers, automatic stokers, pipe-work, etc.; (b) turbo-alternator, sub-station machinery, switchboards, etc. Town Clerk

Talcahuano.—Construction of floating steel dock of 1,000 tons displacement. Direccion del Material Valparaiso

Terralba (Italy).—Municipal waterworks. Estimated cost, £7,700

The Hague.—The Colonial Office at The Hague, require tenders for (1) the metal superstructure with appurtenances for three bridges for ordinary traffic; (2) tip cars and reserve items for light railway. Mr. M. Nijboer, 18, Nieuw-Street The Hague

Valenciennes (France).—For the installation of low-pressure heating apparatus for the Musée

Valparaiso.—Harbour works, estimated cost, 33,140,760 pesos. Minister of Finance, Santiago

Coming Contracts.

Bedwelty.—At a recent meeting of the Bedwelty District Council, amended plans and specifications were put in for a sewerage scheme at a cost of £35,000. The Council will apply for power to borrow this amount.

Bubentsch (Bohemia).—The town of Bubentsch has decided to establish water works, which are to be completed by the end of May, 1907.

Dundee.—The Town Council have instructed the electrical engineer to prepare plans and specifications for a new generating station.

Fife.—The North British Railway Company have agreed to promote a Bill for the construction of a new dock at Methil, Fifehire, which will accommodate steamers of from 5,000 to 7,000 tons. The cost, it is believed, will run to about £500,000.

Genoa.—The Italian Electric Tramways Union have been authorised to construct and work an electric tramway in Genoa between San Martino d'Albaro and Borghoratti.

Kempston.—A Local Government Board inquiry was held last week into an application of the Urban District Council for sanction to borrow £10,800 for the carrying out of a scheme for supplying the district with water.

London.—The cost of rebuilding Blackfriars Bridge, Parliamentary sanction for which is now being sought, is estimated at between £200,000 and £250,000.

Luton.—The Tramways Committee have recommended the Town Council to apply to the Board of Trade for a loan of £57,000 for laying, equipping, and working electric tramways.

Mexico.—A recent issue of the Diario Oficial contains notices of applications by (1) Senor J. A. Pliego Pérez for the appropriation of 1,000 litres of water per second from the river Sinaloa, State of Sinaloa, for metal-refining purposes; (2) Senor M. Calero, for the appropriation of 10,000 litres per second from the river Ixmiquilpan or Tula, State of Hidalgo; and (3) Mr. H. McLean, for an appropriation from the River Grande Misantla, State of Veracruz, for the production of motive power.

Last Day,

Mar. 19

May 7

May 1

Mar. 8

Mar. 14

Mar. 19

April 25

Milan.—The Municipality will shortly proceed to invite tenders for the construction of two electric tramways.

Naples.—H. M. Consul-General at Naples points out that the estimates of the Minister of Railways include a vote of £200,000 to be expended on the Naples railway station. The Budget provides for the construction of 45 new mail vans, and these are to cost £365,000. A new direct telegraph service is also to be laid on from Naples to Turin and from Naples to Reggio in Calabria.

Northallerton.—For purposes of sewerage and sewage disposal works the Urban District Council recently applied to the Local Government Board for the sanction to borrow £7,450.

Ossett (Yorks.).—An inquiry was held last week into the Council's application for sanction to borrow £3,500 for electricity supply.

Poplar.—The borough electrical engineer recently recommended the installation of coal-handling plant, at an estimated cost of £3,000. The Council have adopted the scheme. Application is to be made also for a loan of £5,927 for the electricity undertaking.

Portsmouth.—A considerable amount of electrical plant is likely to be wanted shortly by the Admiralty for Portsmouth Dockyard.

Savigliano.—Offers will shortly be invited for the construction of an electric tramway.

Sofia.—Tenders will shortly be invited by the Ministry of War, Sofia, for the construction of a canal between the Lake of Devna and the port of Varna, at an estimated cost of about £54,400.

South Africa.—The several important extensions which the Railway Administrations of the South African Colonies have on hand are productive of orders for machine tools in addition to permanent way material and rolling stock. Manufacturers should take early steps to secure orders for machinery which the Agent-General will shortly be able to place.

Stoke-on-Trent.—A scheme for extending the electric supply by the Town Council for extending the electric supply plant at a cost of £7,745.

Sunderland.—An inquiry was held last week into the application of the Council for permission to borrow £18,000 for electric lighting extensions.

Switzerland.—The construction has been authorised of an electric tramway from Versoix, in the direction of Divonne-les-Bains, to the Sauverny bridge on the French frontier. It will be a single line of 1 m. gauge and 5.2 kilom. in length; the estimated cost is £38,000, of which £7,900 will be for rolling stock.

Torquay.—An inquiry has been held into Town Council's application for sanction to borrow £5,000 for additional electrical plant and mains.

Torquay.—A Local Government Board inquiry was held on the 20th ult. into the application of the Town Council for sanction to borrow £2,950 and £2,050 for mains extensions and the provision of additional plant respectively.

Contracts Closed.

Battersea.—Messrs. Mather and Platt have secured an order to supply and fix the necessary steam generating plant of a capacity of 850 kw. with engine made by Belliss and Morcom, the dynamo to be mounted on steel plate built into the foundations and connected to the engine at the flywheel only, and the plant to include Korting condenser, spare armature, etc.

Belfast.—Messrs. Harland and Wolff have just received an order from the Anglo-American Oil Company, Ltd., London, for a twin-screw oil-tank steamer, with a dead-weight carrying capacity of about 10,000 tons.

Birmingham.—Thomas Piggott and Co., makers of pipes, tanks, and steel structures, etc., have recently obtained orders for the following: riveted steel pipes, 63 in. and 78 in. diameter, for export; 12 riveted steel leaching vats, 50 ft by 25 ft., for West Africa; cast-iron steam pipes for Birmingham Electric Power Station.

Birmingham.—The British Westinghouse Electric and Manufacturing Co., Ltd., have received the order to equip with magnetic brakes 200 cars now being delivered to the Birmingham Corporation by Messrs. Dick, Kerr and Co., Ltd.

Bishop Auckland.—The Otto-Hilgenstock Coke Oven Company, Ltd., are supplying ten ovens to Messrs. Pease and Partner's, St. Helen's Colliery.

Bristol.—The Docks Committee have accepted the tender of the British Insulator Company for the supply of arc lamps for Avonmouth Dock.

Cardiff.—The Cardiff Steam Coal Collieries Co., of Llanbradach, have placed a repeat order for 25 by-product coke ovens with the Otto-Hilgenstock Coke Oven Company, Ltd. The Cardiff Parks Committee have decided to purchase an electric launch, 30 ft. in length, and capable of carrying about 40 passengers for use on Roath Lake.

Castlereagh.—The Rural District Council have accepted the tender of James Gordon and Co., London, for the hydraulic turbine, gas engine and suction plant, forming the complete power equipment of their electric lighting station.

Croydon.—Messrs. Hudson and Bowring, Ltd., of Manchester, have received an order for the fitting of 16 cars for the Croydon Tramways with their lifeguards, also further orders for Darwen, Derby, Mansfield, and the Manchester Corporation Tramways.

Dunoon.—The Town Council have decided to erect a Hors-fall refuse destructor at a cost of £4,690.

Durham.—The Durham Electrical Distribution Company have placed an order with the Brush Electrical Co., for eight 500 kw. three-phase transformers.

Glasgow.—The Acme Engine Company, Ltd., have just obtained from the Nobel's Explosive Company, Ltd., of Scotland, the contract for two sets of "Acme" gas engines and suction plants, each set to be capable of working at 150 b.h.p. and to drive their refrigerating machinery through friction clutches.

London.—The South Metropolitan Electric Tramways Company have accepted the Brush Electrical Company's tender for a 500 kw. steam turbo-alternator and condensing plant.

London.—The County Council have accepted the tender of Edmundson's Electricity Corporation at £5,565 for extending and making additions to the generating plant at the electricity supply station of Long Grove Asylum.

London.—The American Car and Foundry Company have decided to install 100 Boyer hammers and drills at their new works at Trafford Park, Manchester, the order having been placed with the Consolidated Pneumatic Tool Company, of London.

London.—The City and South London Railway Company has placed an order for six electric passenger lifts for the Euston extension with the Otis Elevator Co., Ltd.

Marylebone.—The Council have been recommended to supply the engine of the Pump Street, and Montpelier for the supply and erection of a centrifugal pump at the general station, and the supply and installation of Messrs. James Sharp and Co. for the supply of box compound at £2 10s. per ton, and that of the British Electric Trades Co. for the supply of pitch at £2 3s. per ton. The Borough Council have accepted the tender of Messrs. Herbert Morris and Bastert, of Loughborough, for the supply of steel plates.

San Francisco.—The California Gas and Electric Corporation have ordered from the Abner Doble Company a Bethlehem nickel-steel hollow-forged shaft, with two 16-in. Doble ring-oiling and revolvable-shell bearings for its Centerville plant.

Sheffield.—Hadfield's Steel Foundry Co., Ltd., are engaged upon an order for wheels and axles for 15-ton wagons for the Furness Railway Company.

Sheffield.—The directors of the South Eastern and Chatham Railway Co. have entrusted Messrs. Mellowes and Co., Ltd., with the patent glazing on their "Eclipse" system of the new roof.

Southend-on-Sea.—The Council have accepted the tender of Messrs. F. Pratt and Co., Ltd., for a lathe for turning steel-tired wheels, at £145 10s. The Corporation have also accepted the tender of Messrs. Crompton and Co., for a Crompton-Belliss steam dynamo, at £2,857, including expansion gear.

Stoke-on-Trent.—A contract for supplying eight powerful six-wheeled coupled bogie freight locomotives for the Manila Railway Company has just been awarded to Messrs. Kerr, Stuart, and Co., of the California Works, Stoke-on-Trent.

Tasmania.—Messrs. Noyes Bros. have secured a contract from the Mount Bischoff Tin Mining Company, Waratah, for the supply of two Escher-Wyss turbines direct-connected to two Westinghouse three-phase generators, supplying energy at 2,200 volts, 50 cycles.

Tipton.—Joseph Wright and Co., Tipton, have recently received from Guest, Keen, and Nettlefolds, Ltd., an order for one of their patent multiplex heater detartrisers for their Cardiff works, to deal with 20,000 gallons of water per hour.

Wakefield.—The tender of Lassen and Hjort, 52, Queen Victoria Street, London, has been accepted for the supply of a water softening and purification plant for £2,500.

West Ham.—The Corporation have accepted the tender of Messrs. Willans and Robinson at £7,429 for a 1,500 kw. turbo-generator (Dick, Kerr generator).

Westminster.—The City Council have decided to purchase a motor wagon, with an interchangeable water tank body, from the Lancashire Steam Motor Company, Ltd. at a cost of 2000.

Wolverhampton.—The Corporation have placed an order for three balancing sets with the Electric Construction Company.

India.—The Directors of the Bombay, Baroda, and Central India Railway Co. require a chief draughtsman in the carriage and wagon department. Preference will be given to one who has had a thorough training in the British Railway, or in the works of a first-class firm of rolling stock builders. Salary, rupees 400 per calendar month. T. W. Wood, secretary, Gloucester House, Bishopsgate Street Without, E.C.

Mar. 20

India.—The Secretary of State for India in Council will, in the summer of 1906, make not less than ten appointments of assistant engineer in the permanent establishment of the Indian Public Works Department, in addition to the appointments to be made from Cooper's Hill College. The age of candidates must not be less than 21, or more than 24 years on the 1st July, 1906.

May 1

London.—Electrical and mechanical engineer, and an assistant electrical engineer for the London County Council. Salaries will be £400 and £200 respectively. Clerk to the London County Council, Spring Gardens, S.W.

Mar. 12

London.—An open competitive examination for not fewer than twelve situations as assistant examiner in the Patent Office will be held by the Civil Service Commissioners in April next. Secretary, Civil Service Commission, Burlington Gardens, W.

April 23

Malay States.—Two assistant engineers to carry out construction of a section of railway in the Federated Malay States or Johore. Crown agents for the Colonies, Whitehall Gardens, London, S.W.

Mar. 10

Walthamstow.—The Council require applications for the post of electrical and mechanical engineer at a salary of £350 per annum, rising by annual increments of £5 to £450; also for the position of traffic manager, to be responsible for the working of the tramways, at a salary of £200 per annum rising by annual increments of £20 to £300.

Appointments Filled.

Bridlington.—Mr. F. Cotton, assistant electrical engineer, York, has been appointed to a similar position at the Bridlington Corporation electricity works.

King's Norton.—Mr. W. F. Bell, an assistant in the borough engineer's department, Aston Manor, has been appointed first assistant engineer and surveyor to the King's Norton Urban District Council.

New South Wales.—Mr. H. Arthur has been appointed manager of the Globe Freehold Mine, N.S.W.

West Ham.—Mr. G. Parry, Corporation electricity works, West Ham, has been appointed charge engineer at the generating station.

Westminster.—Mr. J. Archibald Kyle, A.I.E.E., has received an appointment on the staff of the Westminster Electric Supply Corporation, Ltd.

Appointments Vacant.

Hammersmith.—The Borough Council require an assistant engineer, whose chief duty will be to act as canvasser for the electricity department. Application forms to be obtained from Mr. G. G. Bell, borough electrical engineer, 85, Fulham Palace Road, Hammersmith, W.

May

Prices Current of Coal, Iron, Steel, and Other Metals.

Manufacturers' and Merchants' Quotations.

News of the Week in Brief.

Wednesday, March 27th, 1906.

THE course of the **Pig-iron Market** has been somewhat erratic during the past week. In the earlier part of this period the distinguishing feature was the heavy selling by holders consequent upon the unfavourable report received from America, but a recovery ensued only to be followed by another fall on the announcement of the reduction in the price of German iron in order to meet English competition. The favourable feature is the fact that we are approaching a period when there will be a decrease in the accumulation of iron in the Middlesbrough store. At the moment, however, the accumulation of stock is only being transferred from the warrant yards to the makers' yards, but the increase in shipments which is looked for immediately will remedy this tendency. At the finish pig-iron is active with a somewhat weak tendency, Cleveland closing at 47s. 6d., Scotch 56s., and Hematite 63s. 6d.

The **Copper Market** exhibits somewhat more life, although the volume of business has been reduced, and the heavy fall in Copper shares in New York is a factor which has influenced the course of quotations. At the same time there are better trade reports from America, where consumers have once more begun to take interest in the market, and producers have been exceedingly firm in their quotations, so that this may be considered a set-off against the fall in the price of shares. The latest quotations show a slight improvement at £79 17s. 6d. cash and 478 for three months' metal.

Tin, until the last day or two, has been practically unsupported, and, indeed, large realisations were at one time effected, although it was noted that East was rather an unwilling seller. The statistics, while fairly favourable, were not up to expectation. In the latest dealings a disposition is evident towards re-purchase operations by bears, and there are not wanting signs that speculative support is being given apart from this, so that the closing prices to-day were firmer at £163 cash and £162 15s. three months.

plates, notwithstanding the high cost of tin and other materials, is a matter of much concern to makers whose output has gone on at a record-breaking rate for months past. Already a few makers have decided to restrict operations in the near future unless there are indications of a turn for the better from the low prices which have been accepted, especially by merchants.

Lead after being firmer has again relapsed into dullness, but the arrivals remain on a small scale, and the close is steadier at £16 7s. 6d. soft foreign prompt spot. **Spelter**, after a temporary advance has again relapsed, and in the weak market G.O.B.'s close at £24 7s. 6d. The coal market is rather firmer.

Iron, Steel, Pig-Iron, etc.

SCOTLAND

Messrs. David Colville and Sons, Ltd., Dalzell Steel and Iron Works, Motherwell, N.B. prices follows. Prices

[illegible]

Manufactured Iron:

United Kingdom, except Spain and Italy in England and
 Wales. The number of these species is given in parentheses.




John Spencer (Coatbridge), Ltd., Phoenix Ironworks, Coatbridge, N.B., quote:

Messrs R. Feldtmann and Co., of Glasgow, are the
Sole Importers for the Colony.

Pig-Iron.	No. 1.		No. 2.	
	U. S. d.	A. S. d.	U. S. d.	A. S. d.
Crabapple	1.10	0	1.00	0
Castorino	2.75	0	2.75	0
Shamrock	10.00	0	10.00	0
Goldfish	1.00	0	1.00	0
Leaf 2 inch	1.10	0	1.00	0
Golden	1.00	0	1.00	0
Leaf 7	1.00	0	1.00	0
Chrysanthemum, bush	2.75	0	2.75	0
Edimond	1.00	0	1.00	0
D. Inc. (Hog)	1.00	0	1.00	0
Shed	1.00	0	1.00	0
Leaf 7	1.00	0	1.00	0

NORTH OF ENGLAND

Messrs. W. Whitwell and Co., Ltd., Thornaby
Ironworks, Stockton, quote as follows, at works:-

	c. s. d.
W W  Best	7 10
W W Best Best	7 17 1/2
W W Best Best	8 12 1/2
W W Best Best Best	8 12 1/2
W W Best Sheet	8 0
Thornaby  Best	9 10
Thornaby Best	9 10 1/2
Whitwell Special Admiralty Cable	10 0
Special Chain Iron	10 0
Twine and Nail Strip Iron	not in sh
W W  Angle Bar	7 10
W W Best Angle Iron	8 10
Tee Iron, to 8 inches United	8 10 0

Terms: CASH, less 2 percent discount on both of months following delivery.

LANCASHIRE.

The Pearson and Knowles Coal and Iron Company, Ltd., Dallam and Bewsey Forges, Warrington, quote follows:

		Iron	Steel
		U. S. d.	U. S. d.
	1 Bars	7 1/2 00	8 00 00
	1 Angles	8 00 00	8 00 00
	1 Tees	8 15 00	8 00 00
	1 Beams	8 00 00	8 00 00
	1 Sheets	8 00 00	8 00 00

Output sizes: 1 AS Liverpool in 10 ton lots.

Extra's for Sizes and Cutting is per Last

Lots under 10 cwt. of a size 10S per ton (X10).

STAFFORDSHIRE.

Shelton Iron, Steel, and Coal Company, Ltd., Stoke
on-Trent, North Staffordshire, and 122, Cannon Street
London, quote.

	t	s.	d.
COIN BARS	7	0	0
Best Bars (1 foot long, wide, base 2 in thick, 10 in rounds and squares)	7	0	0
Angles	8	5	0
T. Best	8	0	0
T. Best	8	0	0
Best Shoe Iron	8	0	0
Best Iron	9	0	0
Best Rivet Spikes	9	0	0
Cable	10	5	0
SAVING	9	0	0
Best Turning	3	0	0
Plating	9	0	0
Best Best	10	0	0
Trehle Best	11	5	0
Plates	8	10	0
Best Plates	9	0	0
Boiler Plates	9	10	0
Best Boiler Plates	10	10	0
Trehle Best Boiler Plates	13	0	0

Delivery f.o.b. Liverpool, Birkenhead or Manchester.

Tinplates.

WALES.

Swansea Metal Exchange quote:—

Impurities	by 24 sheets	Bessemer	P. S. I.
Wasters	0.12	0.12	0.12
Semen's primes	0.16	0.16	0.16
Wasters	0.18	0.18	0.18
W. S. by 24 sheets	0.18	0.18	0.18
Wasters	0.14	0.14	0.14
Semen's primes	0.14	0.14	0.14
Wasters	0.12	0.12	0.12
B. 24 by 24 sheets	0.16	0.16	0.16
Wasters	0.14	0.14	0.14
Semen's primes	0.16	0.16	0.16
Wasters	0.14	0.14	0.14
B. 24 by 24 sheets	0.16	0.16	0.16
Wasters	0.17	0.17	0.17
B. 14 by 14 sheets	0.16	0.16	0.16
Wasters	0.16	0.16	0.16
B. 14 by 14 sheets	0.16	0.16	0.16
Wasters	0.12	0.12	0.12
Old size Bessemer primes	0.12	0.12	0.12
Semen's primes	0.12	0.12	0.12
Charcoal fines, Semen's primes	0.14	0.14	0.14
C. A. roofing sheets	0.2	0.2	0.2
Big sheets for roofing on heat by 24 sheets	0.17	0.17	0.17
Finest black plates	0.17	0.17	0.17
Charcoal fines, Semen's primes	0.14	0.14	0.14

All to be, Swansea, cash in 14 days less 1 per cent.

Block Ten, £200 is cash, £204 for three months, Square Market, Ten, the last two months.

Received from works: 7 tall boxes.

Shipped during week, 1, 640 boxes.

Stock remaining at docks, 187, 181 boxes

Messrs. Richard Thomas and Co., Ltd., of 33 and 35, Eastcheap, E.C.—Works: South Wales, Burry, Lydney, Lydbrook, and Cwmbwrla, quote:—

Coke Tinplates:		Per Box.
		Wales.
		£ s. d.
C 18 by 14 1248.	110 lb.	BA
C 20 by 10 2258.	155 "	" Number
C 20 by 14 1128.	108 "	" Lydbrook
C 28 by 20 1128.	216 "	" Lydbrook

WORCESTERSHIRE.

Baldwins, Ltd. (with which is amalgamated Knight and Crowther, Ltd.), Wilden Works, near Stourport, quote:—

	Singles 20 (3 3/4 in.) by 30 in.	Doubles 24 (4 1/4 in.) by 36 in.
per ton.	per ton.	per ton.
£ s. d.	£ s. d.	£ s. d.
"Vale"	11 0 0	12 6 0
"Shield"	11 10 0	12 10 0
"Seven"	12 10 0	13 10 0
"Baldwin Wilden B."	13 10 0	14 10 0
Charcoal	17 10 0	18 10 0
Best Charcoal	19 10 0	20 10 0

Pickled, cold rolled and close annealed sheets specially quoted for.

Extra widths, Singles to 40in, Doubles to 40in, Battens to 46in. Extra

lengths, Singles to 10sm, Doubles to 1, in Letters to 10sin.

Patent Coated Sheets

No. : Lead	U S d	U S d
S.V. Lead	14 10 0	1 10 0
No. : Term	16 0 0	17 0 0
S.V. Term	17 10 0	18 10 0
	Singles	Doubles
	30 G	21 10 2 4 G
	10 10 S	10 98
	by 36 in	by 36 in.
	per ton.	per ton.
	U S d	U S d
	21 0 0	21 10 0
	22 0 0	22 0 0
	21 0 0	21 0 0

Cotton Can Tin Sheets to 39in. by 36in. specially quoted for.

Extreme sizes in Tin and Patent Cans especially suited for

Extreme sizes in Tin and Patent Coat specially quoted for.
Buttons up to 6 wide by 3" W.G. all lined and new top extra throughout.

Labels up to 6" wide by 2" W.G. Cl. 105, 9d per ton extra throughout for all brands.

At work:

Galvanized Corrugated Sheets.

Phonix Brand, 14 1/2, 16, 18, London, in Bundles 14 1/2 to 16 per ton.
Blackwall Brand, 20 G., in felt lined cases for Australia, each London 16 1/2 to 18

Galvanized Working Up-Sheets.

20 G., each London, in Bundles 14 1/2 to 16 per ton.

WALES.

Cordes (Dos Works), Ltd., of Newport, Mon., quote "Star" brand patent wrought nails, steel nails, &c.

Discounts

4 1/2 per cent. off 1 inch to 1 1/2 inch strong rose and all sizes round rod, and 8 1/2 pound.
3 1/2 per cent. off 1 1/2 inch to 2 inch strong rose and 10 1/2 and 20 1/2 pound.
3 1/4 per cent. off all sharp-pointed nails.
Delivered prices of raw, and upwards. Extra 2 1/2 per cent. discount off the gross price of raw, and upwards.
Steel rose flat points, 1 inch to 1 1/2 inch basis.
2 1/2 per cent. off 1 inch to 1 1/2 inch basis.
4 1/2 per cent. off 1 1/2 inch to 2 inch basis.
Steel round rods, 1 inch to 1 1/2 inch basis.
2 1/2 per cent. off 1 inch to 1 1/2 inch basis.
1 1/2 per cent. off 1 1/2 inch to 2 inch basis.
Sht rods, 1 inch to 1 1/2 inch basis, for 20 in. lots.

BELGIUM.

C. L. Faulkner, Suffolk House, Laurence Pountney Hill, London, E.C., quotes:—

Prices quoted are in £ stg. and per ton of 100 kbs. (2,240 lb.) delivered free on board ANTIWERP for approved quantities.

Steel:	£ s. d.
Billets.....	at 4 11 0 per ton.
Sheet Bars.....	at 4 12 0 "
Finshed Steel:	
Bars.....	at 4 18 0 "
Angles.....	at 4 19 0 "
Tees.....	at 4 20 0 "
Joists.....	at 4 21 0 "
Fencing Standards.....	at 4 22 0 "
Sheet Bars.....	at 4 23 0 "
Tie Bars.....	at 4 24 0 "
Half round Bars.....	at 4 25 0 "
Heavy Rods.....	at 4 26 0 "
Light Rods.....	at 4 27 0 "

Structural Steelwork. Prices on application.

GERMANY AND BELGIUM.

Messrs. Oscar Moenich and Co., Billiter House Billiter Street, E.C., quote:—

Belgian No. 2 Bar Iron.....	£ s. d.
Roller Rod Iron.....	17 6 0
Angle Iron.....	18 0 0
Tee Iron.....	18 0 0
Iron Plates.....	18 0 0
Basic Steel Bars.....	18 0 0
Basic Steel Rods.....	18 0 0
Basic Steel Plates, 3/16 in. and thicker.....	18 0 0
Joists.....	18 0 0

All net, f.o.b. Antwerp.
"Double Horse" Bamboo Steel..... 12 6 0
"Double Lion" Steel, 3/16 in. to 1 in. 9 10 0
Increases f.o.b. Antwerp.
Wire Nails, No. 07 1/2..... 8 s. per keg.

CONTINENTAL.

Messrs. W. H. Perrott and Co., 101, Leadenhall Street, London, E.C., quote f.o.b. Antwerp, for approved specifications:—

Steel Joists, Basis.....	£ s. d.
Chimney.....	18 0 0 per ton net.
Bars.....	18 0 0 "
Angles.....	18 0 0 "
Tees.....	18 0 0 "
Joists.....	18 0 0 "
Plates 3/16 in. and up.....	18 0 0 "
Rods 3/16 in. to 1 in. about equally assorted.....	18 0 0 "
Light Rods.....	18 0 0 "
Rivets (Sellers' Mattia) bags.....	18 0 0 "

To Lloyd's Tests, packed in Double Bags.

Metals.

Messrs. French and Smith, 147, Leadenhall Street, and 11, Oldhall Street, Liverpool, quote:—

TIN.

English Tin, 100 lbs. per cwt. 100 0 0
English Tin, 50 lbs. per cwt. 100 0 0
English Tin, 25 lbs. per cwt. 100 0 0
Strait G.M.B., 3 months, Warehouse, 100 0 0
V.M.B., 3 months, Warehouse, 100 0 0

COPPER.

Copper..... 100 0 0
Spanish C.M.B., 3 months, Warehouse, 100 0 0
Strait G.M.B., 3 months, Warehouse, 100 0 0
English Large C.M.B., 3 months, Warehouse, 100 0 0
English Large C.M.B., 3 months, Warehouse, 100 0 0
English Large C.M.B., 3 months, Warehouse, 100 0 0
English Large C.M.B., 3 months, Warehouse, 100 0 0
English Large C.M.B., 3 months, Warehouse, 100 0 0
English Large C.M.B., 3 months, Warehouse, 100 0 0
English Large C.M.B., 3 months, Warehouse, 100 0 0

YELLOW METAL.

Yellow Metal:..... £ s. d.
Shells, 100 lbs. per cwt. 100 0 0
Shells, 50 lbs. per cwt. 100 0 0

SPELTER.

Silesian Spelter, Net..... 100 0 0
Blende of Spelter, Net..... 100 0 0
Calamine, Net..... 100 0 0

LEAD.

English Pig, Warehouse, Dis..... 100 0 0
Spanish Pig, Warehouse, Dis..... 100 0 0
Lead Ore, 100 lbs. per cwt. 100 0 0

ANTIMONY.

Star Regulus, 100 lbs. per cwt. 100 0 0
Ore, 100 lbs. per cwt. 100 0 0
Crude, 100 lbs. per cwt. 100 0 0

QUICKSILVER.

Spanish, 100 lbs. per cwt. 100 0 0
Italian, 100 lbs. per cwt. 100 0 0

Coal.**LEICESTERSHIRE.**

The Nailstone Colliery Company, Leicester, quote Price per ton of 20 cwt., with 1 cwt. per ton of 20 cwt.

Upper Main Seam:

M.C. 100 0 0
Best Hard Seam, 100 lbs. per cwt. 100 0 0
Best Hard Seam, 50 lbs. per cwt. 100 0 0
Best Hard Seam, 25 lbs. per cwt. 100 0 0

DERBYSHIRE.

The Manners Colliery Company, Ltd., of Ilkeston, quote f.o.b. Ilkeston, for approved specifications:—

Kilburn Coal:

Best Hard Seam, 100 lbs. per cwt. 100 0 0
Best Hard Seam, 50 lbs. per cwt. 100 0 0
Best Hard Seam, 25 lbs. per cwt. 100 0 0
Best Hard Seam, 12 1/2 lbs. per cwt. 100 0 0
Best Hard Seam, 6 1/4 lbs. per cwt. 100 0 0
Best Hard Seam, 3 1/8 lbs. per cwt. 100 0 0

Weekly Synopsis of Company Meetings and News.

Palmer's Shipbuilding Company, Ltd.

The board announce an interim dividend at the rate of 5 per cent. per annum on both the preference and ordinary capital, in respect of the half-year ending December 31st last.

South Durham Steel and Iron Company, Ltd.

The profits since the commencement of the present financial year on October 1st, 1905, have enabled the directors to declare an interim dividend on the ordinary shares of 1s. per share, payable on April 14th, 1906. The works of the company are fully and profitably employed, and the order books are well filled to the end of the year.

Walkers, Parker and Co., Ltd.

The directors in their annual report, state that the results for the year 1905 are satisfactory. The net trading profits amount to £29,033, and after providing for interest on debentures and other head office expenses, there remains £6,644. To this must be added the corrected amount (£29,673) brought forward from 1904, after payment of the dividend of 3 per cent. declared at last general meeting, making together £16,317. Out of this sum the directors recommend the distribution of a similar dividend of 3 per cent. on the preference share capital, which will absorb £6,000 and leave a balance of £10,317 to be carried forward.

H. Williamson and Sons, Ltd.

The directors recommend a dividend in respect of the last half-year on the ordinary shares after the rate of 6 per cent. per annum (free of income-tax), placing £2,000 to reserve, and leaving to be carried forward £1,024.

Gloucester Railway Carriage and Wagon Company, Ltd.

The directors have declared an interim dividend at the rate of 6 per cent. per annum for the half-year ended December 31st last.

Talbot Continuous Steel Company, Ltd.

The report for the year ended 31st December, 1905, to be presented to the meeting at Middlesbrough, on the 9th inst., shows a profit of £1,566, as compared with £707 last year. The debit balance is thus reduced to £3,373. During the period under review considerable attention has been given to the company's process in many quarters, and although the profits do not show any great increase, the directors consider that a solid foundation for the more rapid growth of the process in the future has been laid.

Antrim Iron Ore Company, Ltd.

The directors recommend a dividend of 3 1/2 per cent., making, with the interim dividend paid, 5 1/2 per cent. for the year ended December 31st last.

Moss Bay Hematite Iron and Steel Company, Ltd.

The directors announce an interim dividend at the rate of 4 per cent. per annum for the half year ended December 31st last.

William Beardmore and Company.

The directors recommend dividends of 5 per cent. on the £500,000 of preferred capital, and of 6 per cent. on the £1,500,000 ordinary capital, in the latter case free of income tax, leaving £103,680 to carry forward. Last year the dividend on the ordinary shares was also 6 per cent., but only £95,070 was carried forward.

Hadfield's Steel Foundry Company, Ltd.

At a meeting of the directors held on Monday it was decided to recommend that, in addition to the interim dividend of 1s. per share paid in August last on the ordinary shares, a further dividend be paid on the ordinary shares of 2s. per share, together with a bonus of 1s. 6d. per share. This is at the rate of 22 1/2 per cent. for the year, a distribution similar to that of a year ago.

Rivet, Bolt and Nut Company, Ltd.

In their report for the year ended December 31st the directors recommend after writing off £11,764 for depreciation, a dividend of 5 per cent. on the ordinary shares, leaving a balance of £7,964 to be carried forward, subject to income-tax, directors and auditors' fees.

New Companies Registered.

In the following list the registered addresses of New Companies are given, whenever possible. As, however, this information may be legally withheld until the actual date of commencing business, addresses are not always obtainable.

Ackworth Coal Syndicate Ltd.

The capital of this company is £25,000 in 25 shares. Object to acquire any mines, mining rights, and mineral properties in Yorkshire or elsewhere, to adopt an agreement with C. E. Featherstonhaugh, and to carry on the business of colliery proprietors, coal merchants, ironmasters, steel makers and converters, gas and coke manufacturers, etc. No initial public issue.

James Simpson and Sons (Bolts and Nuts), Ltd.

Capital, £2,000 in 40 shares. Object to acquire the business of manufacturers of bolts, nuts, rivets and other iron work carried on by A. E. Horton, L. W. Horton, J. Davies, and S. M. Slater (trustees of the will of the late E. Horton), at the Acorn Works, Darlaston, Staffordshire, as James Simpson and Sons, and to carry on the same. No initial public issue. Registered office, Acorn Works, Bills-street, Darlaston.

Lumsden Machine Company, Ltd.

Capital, £2,000 in 20 shares. Object to acquire the business of an engineer and tool merchant, carried on by T. Lumsden at Coulthard's Lane, Gateshead, to acquire the interests, rights, privileges and property of T. Lumsden and A. B. Roxburgh, in an invention relating to a wood-trimming machine. No initial public issue. Registered office, East Street, Coulthard's Lane, Gateshead.

James Ford and Sons, Ltd.

Capital, £100,000 in 40 shares. Object, to acquire the business carried on by J. Ford at the Jubilee Nut Works, Farnsworth, Lancashire and at Park-lane Works Dudley Port, Tipton, Staffordshire, and to carry on the business of bolt, nut and rivet manufacturers, makers, importers and exporters of and dealers in bars, hoops, screws, and nails, etc. No initial public issue. Jubilee Nut Works, Farnsworth, Lancashire.

Peacock, Cliff and Co., Ltd.

Capital, £2,000 in 20 shares. Object to acquire the business carried on by F. A. Cliff as Peacock and Co., and to carry on the business of engineers, iron brass and steel foundries and finishers, electricians, wheelwrights, millwrights, machinists, etc. No initial public issue.

Company Liens.

Clarkson, Ltd., Chelmsford.

Trust deed and particulars required by sub-section 4-section 14 of the Companies Act, 1900, registered February 14th for £15,000 debentures; trustee, Liverpool Mortgage Insurance Company, Ltd.; charged on leasehold hereditaments and premises in Chelmsford; an endowment policy for £100,000 on the life of Thomas Clarkson; and the undertaking and all the property, present and future, including the uncalled capital for the time being.

Bolckow, Vaughan and Co., Ltd., Middlesbrough.

Lien registered February 23rd, for £33,100 four per cent debentures, part of £1,000,000; amount previously issued, £307,000; no trustees; charged on all the property, present and future, and the undertaking.

North Central Wagon Company, Ltd., Rotherham.

Lien registered February 23rd, for £1,000,000 (renewals), part of £1,000,000; amount issued, £835,707; no trustees; charged on the undertaking and all the property, present and future.

Midland Tube and Forging Company, Ltd., Bournbrook, near Birmingham.

Deed registered February 23rd, for £1,000,000 (renewals), part of £1,000,000; amount issued, £835,707; no trustees; charged on the undertaking and all the property, present and future.

Ordoverax Photo-printing.

The process for producing a new light sensitive process for the reproduction of drawings and architectural drawings, and the apparatus for applying and exposing plates to produce carbon black lines has been very marked. Commencing with the blue print, we have gone upwards to blue on white, ferro-gallic black on white, white on paper, and black on blue on white. All these have been tried, but by means of the Ordoverax, and some modern modifications, we have applied one of Poietvins' inventions of sixty years ago, to the production of a beautiful carbon black line on a white ground, which never fades, and when well done, is scarcely distinguishable from an inked drawing.

All these reproductions have one fault, viz., shrinkage, owing to which civil engineers and architects are often unable to make use of any of these processes and continue to use tracings. After a long series of experiments, Messrs. B. J. Hall and Co., Ltd., of 30, Victoria Street, S.W., have recently perfected a new composition termed "Ordoverax." This material is melted and run on metal or glass plates; after setting, an exposed but undeveloped blue print is placed face downwards on the "Ordoverax." On removal, the lines of the print will take up ink from an inking roller, whilst the ground remains clean. At least twelve good copies can be obtained by placing white papers or cloth on the "Ordoverax" plates, which must be inked for each impression.

The copies are permanent; they do not require washing; they may be taken in black or coloured inks, and on drawing paper, tracing paper, tracing cloth, white cloth, tinted papers, cardboard, or any material on which it is possible to print.

The great advantage is that the copies correspond line for line with the original, but in addition to this there is a saving in cost of electric current and sensitised papers; and, where several copies are required, these can be produced in black lines on white ground, at a lower cost than it is now possible to produce a like quantity of blue prints.

The original blue print may be developed and used if desired. Portions of the work not required to be shown can be stopped out. The process is one which can be readily worked in conjunction with an ordinary day or electric light printing outfit. There is no need to stock a variety of sensitised papers of different kinds and thicknesses, which so readily deteriorate and form such an expensive item in the cost of a photo-printing department.

The inventors claim that when once the blue printer has acquired skill in the use of "Ordoverax," he will be able to treble his output at a reduced cost, and transform a rather monotonous task into a fascinating art.

Mr. J. N. DE JONGH has been selected for the presidency of the Transvaal Chamber of Mines, Johannesburg.

In consequence of tramway disturbance, the observatory at Kew is about to be removed to a secluded site in Dumfriesshire.

Share List of Engineering, Electrical, Iron and Steel, and other Companies.

The following is a comprehensive list of Companies in the industries covered by "Page's Weekly," in which shares business is being currently transacted. Additions will be made from time to time as occasion requires. We desire to state that without Share List will generally be found correct. We do not hold ourselves responsible for any loss or inconvenience that may arise from possible inaccuracies.

STOCK EXCHANGE SETTLING DAYS.—Settling days on the Stock Exchange are as follows:—

Consols: April 4th. General Settlements: March 9th, 28th; April 17th. Bank Rate, September 28th, 1905, 4 per cent.

Engineering, Iron, and Steel Companies.

Engineering, Iron and Steel Companies. *Contd.*

Present Amount Subscribed	Shares	Last Dividend	Name.	Paid up	Closing Prices.	Present Amount Subscribed	Shares	Last Dividend	Name.	Paid up	Closing Prices.
11,370	5	5%	Alldays & Onions Pneumatic Engineering, Ltd.	3	2 1/2-3 1/2	200,000	5	10 sh.	Dunderland Iron Ore Co., Ltd., 6% Cum. Pref. and Participating.	5	3 1/2-4 1/2
10,000	5	3	Do. Cum. Pref. 6 per cent.	5	1 1/2-2 1/2	4,721	13	13	Ebbw Vale Steel, Iron & Coal Co., Ltd.	13	10 1/2-11 1/2
250,000	Stk	4 1/2	Do. Mort. Deb. 4 1/2%	100	98-102	69,754	13	10 1/2	do. do. do.	10	8 1/2-9 1/2
50,000	1	5 1/2	Alley and Maclellan, Ltd.	1	19 1/2-20 1/2	20,250	10	8 1/2	Elliott's Metal, Ltd.	10	8 1/2-9 1/2
5,210,000	1	1	Armstrong (Sir W. G.), Whitworth and Co., Ltd.	1	3 1/2-3 3/4	5,000	10	5 1/2	Do. Cum. Pref. 5%	10	8 1/2-9 1/2
25,750	5	20	Do. 4 1/2% Cum. Pref.	5	5 1/2-5 1/2	186,748	Stk	4 1/2	Do. Deb. 1 1/2%	100	32 1/2-34 1/2
1,500,000	100	40	Do. 4 1/2% Ist Mort. Deb. Rd.	100	102-104	300,000	1	5 1/2	Fairbairn, Lawson & Combe Barbour	1	23 1/2-24 1/2
1,000	10	4 1/2	Arrol (Sir William) & Co., Ltd.	10	10 1/2-10 1/2	300,000	100	4 1/2	Do. 5% Cum. Pref.	100	20 1/2-21 1/2
7,900	10	2 1/2	4 1/2% Cum. Pref., Nos. 1-15,000	10	10 1/2-10 1/2	25,000	10	6 1/2	Fairfield Shipbuilding & Engng. Co., Ltd., 6% Cum. Pref.	10	11 1/2-12 1/2
70,000	100	2 1/2	Austin, S. P. & Son, Ltd.	all	1 1/2-1 1/2	225,000	Stk	4 1/2	Do. 4 1/2% Ist Mort. Deb. Stk. Red.	100	100-102
1,100,000	100	4 1/2	Aveling and Porter, Ltd., 4 1/2% Reg. Mt. Deb. Red.	100	94-97	126,000	3	2 1/2	Fraser & Chalmers, Ltd., Ord.	3	3 1/2-4 1/2
1,000,000	5	10 1/2	Avery (W. & L.), Ltd.	5	10 1/2-10 1/2	21,000	3	4 1/2	Do. 7 1/2% Cum. Pref.	3	5 1/2-6 1/2
1,000,000	Stk	4 1/2	Do. Cum. Pref. 5%	100	100-102	10,000	10	3 1/2	Galloways Ltd., 5% Cum. Pref.	10	7 1/2-8 1/2
1,000,000	1	1 1/2	Do. Deb. 4 1/2%	100	100-105	1,000,000	Stk	4 1/2	Do. 4 1/2% Ist Mort. Deb. Red.	100	85-87
1,000,000	1	1 1/2	Babcock and Wilcox, Ltd., Ord.	1	32-44	100,000	1	5 1/2	Glover, W. T. & Co., 5% Cum. Pref.	1	11 1/2-16 1/2
1,000,000	1	1 1/2	Do. 5% Cum. Pref.	1	100-102	100,000	Stk	1 1/2	Do. 4 1/2% Ist Mort. Deb.	100	85-90
200,000	1	5 1/2	Bagnall, John & Son, Ltd.	1	10 1/2-11 1/2	100,000	10	7 1/2	Greenwood & Bailey, Ltd., Ord.	10	6 1/2-6 1/2
200,000	5	3 1/2	Baker (Joseph) and Sons, Ltd., 6% Cum. Pref.	5	5 1/2-5 1/2	110,000	10	7 1/2	Do. 7 1/2% Cum. Pref.	10	10 1/2-11 1/2
250,000	1	6 1/2	Baldwins, Ltd., 6% Cum. Pref.	1	1 1/2-1 1/2	8,000	100	5 1/2	Do. 5% Deb.	100	102-103
250,000	Stk	4 1/2	Do. 4 1/2% Deb. Stk. Red.	100	104-105	905,000	1	2 1/2	Guest, Keen & Nettelfields, Ltd., Ord.	1	28-29
150,000	44	3 1/2	Barrow Hematite Steel Co., Ltd., O	44	3 1/2-3 1/2	344,000	5	2 1/2	Do. 4 1/2% Cum. Pref.	5	8 1/2-9 1/2
50,000	44	3 1/2	Do. do. Cum. 2nd. Pref.	44	3 1/2-3 1/2	13,000	5	2 1/2	Gwynnes, Ltd., 5% Cum. Pref.	5	2 1/2-3 1/2
150,000	5	5 1/2	Bayliss, Jones and Bayliss, Ltd., 5% Cum. Pref. Shares	5	1 1/2-1 1/2	250,000	1	1 1/2	Hadfield's Steel & Iron Co., Ltd., Ord.	1	12 1/2-13 1/2
250,000	100	4 1/2	Beardmore (Wm.) & Co., Ltd., 4 1/2% Ist Mt. Deb., Red. Scrip 50% pd	100	100-102	30,000	5	3 1/2	Hall (J. & E.), Ltd., 6% Cum. Pref.	5	4 1/2-5 1/2
1,000,000	Stk	4 1/2	Bell Brothers, Ltd., 6% Cum. Pref.	10	12 1/2-13 1/2	28,001	5	7 1/2	Head, Wrightson & Co., Ltd.	5	5 1/2-6 1/2
128,230	10	5 1/2	Do. 4 1/2% Deb. Stock, Red.	10	11 1/2-12 1/2	100,000	Stk	6 1/2	Hornby (Richard) & Sons, Ltd., Ord.	100	100-105
17,000	Stk	1	Do. Mort. Deb. 4 1/2%	100	100-104	45,000	100	1 1/2	Hudswell and Clarke and Co., Ltd.	100	85-87
1,629,760	1	10 1/2	Blith Shipping Company, Ltd.	1	8-8 1/2	140,000	10	10 1/2	Kings' Norton Metal Co., Ltd.	10	17 1/2-18 1/2
1,950,000	1	3 1/2	Do. Nos. 1-1,629,760	1	20 1/2-21 1/2	37,500	10	7 1/2	Do. Cum. Pref.	10	14 1/2-15 1/2
5,000	10	5 1/2	Bow, M'Lehian & Co., Ltd.	10	9 1/2-10	49,837	10	5 1/2	Knoch, Ltd.	10	17 1/2-18 1/2
2,000,000	15	22 1/2	Briggs (Henry) Son & Co., Ltd., "A"	15	20-22	15,000	10	5 1/2	Do. Cum. Pref. 5%	10	10 1/2-11 1/2
2,000,000	15	22 1/2	Do. do. "B"	15	21-22	10,000	10	15 1/2	Lanarkshire Steel Ltd., 5% Cum. Pref.	10	8 1/2-9 1/2
2,000,000	15	22 1/2	Brown, Lintley & Co., Ord.	1	40 1/2-41 1/2	120,000	3	8 1/2	Leeds Forge Ltd., Ord.	3	12 1/2-13 1/2
2,000,000	1	1 1/2	Do. 6% Cum. Pref.	1	8 1/2-8 1/2	150,000	10	5 1/2	Do. 5% Ist Mortgage Deb.	50	51 1/2-52 1/2
1,100,000	1	4 1/2	Brown, John and Co., Cum. Ord.	1	1 1/2-1 1/2	23,405	5	0 1/2	Lond. & Glas. Ice & Iron Ship.	5	9-10
1,000,000	1	6 1/2	Do. Ord., Nos. 1-1,100,000	15 1/2	1 1/2-1 1/2	200,000	1	7 1/2	Lysaght (John), Ltd., Cum. Pref.	1	15 1/2-16 1/2
74,000	5	5 1/2	Do. 5% Cum. Pref.	10	11 1/2-12 1/2	230,000	Stk	4 1/2	Do. 4 1/2% Ist Mt. Deb. Stk. Red.	100	105-111
5,000	5	2 1/2	Cammell, Laird & Co., Ltd., Ord.	5	10 1/2-10 1/2	15,000	10	6 1/2	Maclellan, P. & W., Ltd., Ord.	10	8 1/2-9 1/2
500,000	Stk	4 1/2	Do. 5% Cum. Pref.	5	5 1/2-5 1/2	15,000	10	6 1/2	Do. 6% Cum. Pref. Nos. 15,001-30,000	10	8 1/2-9 1/2
400,000	Stk	4 1/2	Do. Mort. Deb. 1 1/2%	10	99-100	15,000	10	6 1/2	Do. 4 1/2% Ist Mort. Deb. Red.	10	10 1/2-11 1/2
1,000,000	1	1 1/2	Cargo Fleet Iron Co., Ltd., Ord.	1	12 1/2-13 1/2	40,000	10	5 1/2	Do. Nos. 1-1,500	10	18-19
11,000	10	5 1/2	Do. 4 1/2% First Mort. Deb.	100	95-97	20,000	10	5 1/2	Mather & Platt, Ltd., 5% Cum. Pref.	10	11 1/2-12 1/2
40,000	5	5 1/2	Carforth Granite Iron	10	10 1/2-11 1/2	75,000	1	6 1/2	Messers' Bros. Ltd., Ord.	1	1 1/2-2 1/2
62,500	1	6	Chamberlain & Hookham, Ltd.	5	12 1/2-13 1/2	275,000	Stk	4 1/2	Do. 5 1/2% Cum. Pref.	100	99-102
100,000	100	2 1/2	Chloride Electrical Storage	1	5 1/2-5 1/2	50,000	1	5 1/2	Meldrum Bros. 5 1/2% Cum. Pref.	1	17 1/2-18 1/2
450,000	1	1 1/2	Clarke, Chapman & Co., Ltd.	1	5 1/2-5 1/2	18,117	5	5 1/2	Muntz Metal, Ltd.	5	4 1/2-5 1/2
70,000	5	2 1/2	Do. 5 1/2% Ist Mort. Deb.	100	97-99	150,000	1	6 1/2	National Gas Engine Co., Cum. Pref.	1	23 1/2-24 1/2
250,000	Stk	4 1/2	Clayton & Shuttleworth, Ltd., Ord.	5	5 1/2-5 1/2	20,000	10	6 1/2	Norman's Ironworks, Ltd.	1	9 1/2-10 1/2
50,000	1	5 1/2	Do. 5% Cum. Pref.	100	100-102	200,000	Stk	4 1/2	Do. 4 1/2% Ist Mort. Deb.	100	90-95
50,000	1	5 1/2	Coghlan Steel & Iron Co., L. Ord.	1	19 1/2-20 1/2	80,000	5	6 1/2	North-Eastern Steel Co., Ltd.	1	9 1/2-10 1/2
100,000	10	30	Do. 5 1/2% Cum. Pref.	1	19 1/2-19 1/2	225,000	Stk	4 1/2	Do. 4 1/2% Ist Mt. Deb. Stk. Red.	100	92-96
7,000	10	10	Connell Iron Co., Ltd., Ord.	10	12 1/2-13 1/2	10,510	1	2 1/2	Palmer's Snipbuilding & Iron Co., Ltd.	all	19 1/2-19 1/2
40,000	10	5 1/2	Do. 5 1/2% Cum. Pref.	10	11 1/2-12 1/2	391,455	1	2 1/2	Do. B.	10 1/2-15 1/2	
15,000	1	5 1/2	Delta Metal, Ltd. Shares	1	5 1/2-5 1/2	170,270	1	2 1/2	Do. 5% Cum. Pref.	all	22 1/2-23 1/2
25,000	5	10	Docker Bros. Ltd.	5	6 1/2-6 1/2	200,000	10	2 1/2	Do. 4 1/2% Cum. Pref.	all	90-95
1,000,000	1	5 1/2	Do. Cum. Pref.	5	6 1/2-6 1/2	122,000	5	1	Pearson & Knowles, Ltd.	all	90-95
1,000,000	1	5 1/2	Dorman, Long & Co., Ltd.	1	17 1/2-18 1/2	50,000	5	6 1/2	Do. Co., Ltd., Ord., "B"	5	5 1/2-6 1/2
2,000,000	Stk	4 1/2	Do. 4 1/2% Ist Mort. Deb. Stk.	100	94-95	17 1/2-18 1/2	5	6 1/2	Do. 6% Cum. Pref. "A"	5	6 1/2-6 1/2
40,000	1	1	Do. 4 1/2% Ist Mort. Deb.	50	44-45						

Stocks and Shares marked * are quoted ex-dividend.

Engineering, Iron and Steel Companies.

Electrical Manufacturing Companies.

Present Amount Subscribed	Shares	NAME	Paid Up	Closing Prices
70,000	10	Pense & Partners, Ltd., Ord.	10	13 1/2
300,000	10	Do. Deferred	10	92 1/2
\$400,000	Stk	Do. 5% Perp. Deb. Stock	100	100-103
1,000,000	1	Peebles (Bruce) & Co., Ltd., 5% Cum. P.	5	44 1/2
65,000	1	Pooley (Henry) & Son, Ltd., Ord.	1	100-101
13,000	1	Do. 5% Cum. Pref.	5	44 1/2
135,558	5	Do. 5% Cum. Pref.	5	26 1/2
73,062	5	Rhymney Iron Co., Ltd.	5	10 1/2
\$330,000	5	Do. New 5% Mort. Deb., Red.	5	10 1/2
850,000	1	Richardsons, Westgarth & Co., Ltd., Ord. 350,001-700,000	1	10 1/2
\$250,000	1	Do. 10% Cum. Pref.	1	10 1/2
\$350,000	Stk	Do. 4 1/2% Perp. Deb. Stock	100	100-102
47,500	10	Rivet, Bolt & Nut, Ltd., 5% Cum. Pref., No. 1-27,500	10	94 1/2
100,000	10	Russell, John & Co., Ltd., Cum. Pref. 5%	10	9 10
100,000	Stk	Do. Deb. 4%	100	94 101
35,000	10	Ruston, Proctor & Co., Ltd., Ord. Mort. Debts. 4 1/2% Cum. Pref.	10	11-11 1/2
\$250,000	1	Do. 5% Cum. Pref.	100	91-95
275,000	1	Scott (Walter) Ltd., Ord.	1	9 1/2
300,000	1	Do. 6% Cum. Pref.	1	1-1 1/2
\$240,000	Stk	Do. 4% Perp. Deb. Stk.	100	92-95
549,700	1	Sheepbridge Coal and Iron Ord. 250,001/799,700	1	29 1/2
112,255	1	Do. Guar. Pref. (5% Min.)	1	31 1/2
1,075,725	1	Do. 4% Perp. Deb. Stk.	8	12 1/2-13 1/2
\$111,800	100	Shelton Iron, Steel and Coal Co., Ltd., 1st Charge 5% Debts. Red.	100	95-98
294,400	100	Do. 6% 2nd Mort. Deb., Red.	100	98-100
200,000	1	Smith's Dock Co., Ltd., Ord.	100	102 1/2
200,000	100	Do. 4% Deb. Stk.	100	90-101
100,000	1	Smith's Thomas, Stamping Wks. L.	1	20-30
250,000	1	Do. 6% Cum. Pref.	1	14 1/2
800,000	1	South Darnam Steel & Iron, Ltd., Ord.	1	14 1/2
\$300,000	Stk	Do. 4 1/2% Per. Deb. Stock	100	92-95
100,000	10	Spencer, John and Sons, Ltd.	10	14 1/2
200,000	100	Do. 6% Mort. Deb.	100	98-100
6,000	100	Staveley Coal and Iron A	60	142 1/2
318,100	10	Do. B	10	214-21
6,100	10	Do. C	60	142 1/2
3,100	10	Do. D	60	142 1/2
49,560	10	Steel Co. of Scotland, Ltd., Nos. 1-49,560	9	74 1/2
116,240	Stk	Do. 5% 1st Mort. Deb. Stk. A	100	100 1/2-110
109,000	Stk	Do. 6% 2nd Mort. Deb. Stk. B	100	100 1/2-110
85,000	10	Stewarts & Lloyds, Ltd., Ord.	100	103-106
55,000	10	Do. 6% Cum. Pref.	100	104-110
280,000	Debs.	Do. 3 1/2% Debts. Red. Nos. 1-3,500	100	14 1/2-15
694,732	1	Swan, Hunter & Wisham, Richardson, Lim. Ord.	1	18-19
538,845	1	Do. 5% Cum. Pref.	1	18-19
\$240,000	Stk	Do. 4 1/2% 1st Mort. Deb. Stk. Red.	100	90-101
249,632	1	Talbot Continuous Steel Process Ord.	1	90-101
100,000	100	Tannett Walker and Co. Ord.	1	90-101
300,000	1	Do. 4 1/2% 1st Mort. Deb. Stk.	100	69-73
\$200,000	100	Thames Iron Works, Shipbuilding & Engineering Co., Ltd., 5% Cum. P.	100	80-84
\$148,000	1	Do. 4 1/2% 1st Mort. Deb. Stk.	100	80-84
\$148,000	1	Thornycroft (John I.) & Co., Ltd., Ord.	1	80-84
160,000	Stk	Do. 6% Cum. Pref.	1	80-84
80,000	1	Do. 5% Deb.	100	103-104
\$200,000	1	Tredgar Iron and Coal A	100	103-104
200,000	1	Do. B	100	103-104
25,000	1	Turnbull & Ayley & Co., Ltd., Ord.	1	150-160
20,000	1	Do. 5% Cum. Pref., Nos. 1-20,000	1	50-60
10,000	1	Do. 5% Cum. Pref., Nos. 20,001-40,000	1	99-100
\$50,000	1	United States Steel Corp. Cum. Stk	100	42 1/2
\$50,000	1	Do. 7% Cum. Pref. Stock	100	42 1/2
\$50,000	1	Do. 10% Cum. Pref. Stk.	100	42 1/2
3,700,000	1	Vickers, Sons & Maxam, Ltd., Ord.	1	2-2 1/2
1,750,000	1	Do. Non-Cum. Pref.	1	2-2 1/2
\$1,250,000	Stk	Do. 5% Non-Cum. Pref. Stock	100	100-102
\$1,250,000	Stk	Do. 4 1/2% 1st Mort. Deb. Stk. Red.	100	100-102
\$1,250,000	Stk	Do. 4 1/2% 2nd Mort. Deb. Stk. Red.	100	100-102
140,000	1	Walker, C. & Co., Ltd., Ord.	1	20-22
148,530	1	Do. 5% Cum. Pref.	1	20-22
\$3,850	1	Walton, Shipways & Iron, Co., Ltd. Ord.	1	100-100
\$3,850	1	Do. 5% Cum. Pref.	1	100-100
\$70,000	1	West & Sons, Ltd., Ltd., Ord.	1	1-1 1/2
\$1,000,000	1	Do. 6% Cum. Pref. Ord.	1	1-1 1/2
\$1,000,000	1	Do. 4 1/2% 1st Mort. Deb. Stk.	100	100-102

Present Amount Subscribed	Shares	NAME	Paid Up	Closing Prices
70,000	1	Alliance Elec. Co., Ltd., 5% Cum. P.	1	1 1/2
125,000	1	Do. 4 1/2% 1st Mort. Deb. Stk. Red.	1	1 1/2
120,000	1	Do. 4 1/2% 2nd Mort. Deb. Stk. Red.	1	1 1/2
\$410,000	1	British Aluminium Co., Ord.	1	1 1/2
\$410,000	1	Do. 5% Cum. Pref.	1	1 1/2
\$280,800	Stk	Do. 5% 1st Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 2nd Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 3rd Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 4th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 5th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 6th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 7th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 8th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 9th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 10th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 11th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 12th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 13th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 14th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 15th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 16th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 17th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 18th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 19th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 20th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 21st Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 22nd Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 23rd Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 24th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 25th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 26th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 27th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 28th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 29th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 30th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 31st Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 32nd Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 33rd Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 34th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 35th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 36th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 37th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 38th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 39th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 40th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 41st Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 42nd Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 43rd Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 44th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 45th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 46th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 47th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 48th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 49th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 50th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 51st Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 52nd Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 53rd Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 54th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 55th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 56th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 57th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 58th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 59th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 60th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 61st Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 62nd Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 63rd Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 64th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 65th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 66th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 67th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 68th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 69th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 70th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 71st Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 72nd Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 73rd Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 74th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 75th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 76th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 77th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 78th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 79th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 80th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 81st Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 82nd Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 83rd Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 84th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 85th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 86th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 87th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 88th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 89th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 90th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 91st Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 92nd Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 93rd Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 94th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 95th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 96th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 97th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 98th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 99th Mort. Deb. Stk. Rd.	100	50-54
\$280,800	Stk	Do. 5% 100th Mort. Deb. Stk. Rd.	100	50-54

Locomotive Builders.

Present Amount Subscribed	Shares	NAME	Paid Up	Closing Prices
200,000	1	Beyer, Peacock and Co., Ltd., Ord.	1	69-10/0
200,000	1	Do. 5% Cum. Pref.	1	2-4
\$200,000	Stk	Do. 5% 1st Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 2nd Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 3rd Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 4th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 5th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 6th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 7th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 8th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 9th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 10th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 11th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 12th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 13th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 14th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 15th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 16th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 17th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 18th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 19th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 20th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 21st Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 22nd Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 23rd Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 24th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 25th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 26th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 27th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 28th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 29th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 30th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 31st Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 32nd Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 33rd Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 34th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 35th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 36th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 37th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 38th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 39th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 40th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 41st Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 42nd Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 43rd Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 44th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 45th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 46th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 47th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 48th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 49th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 50th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 51st Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 52nd Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 53rd Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 54th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 55th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 56th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 57th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 58th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 59th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 60th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 61st Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 62nd Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 63rd Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 64th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 65th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 66th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 67th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 68th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 69th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 70th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 71st Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 72nd Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 73rd Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 74th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 75th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 76th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 77th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 78th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 79th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 80th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 81st Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 82nd Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 83rd Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 84th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 85th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 86th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 87th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 88th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 89th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 90th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 91st Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 92nd Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 93rd Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 94th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 95th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 96th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 97th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 98th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 99th Mort. Deb. Stk. Rd.	100	100-101
\$200,000	Stk	Do. 5% 100th Mort. Deb. Stk. Rd.	100	100-101

Share List—Continued.

Railway Carriage and Wagon Companies.

Present Amount Subscribed	Shares	Last Dividend	Name	Paid up.	Closing Prices
10,000	10	7/6	Birm. Rail.-Car. & Wagon, L., 1-10,000	10	244-26
7,738	10	3/-	Do. Second Issue 1-8,738,...	4	94-10
10,000	10	6/-	Do. Cum. Pref. 6% 1-10,000,...	10	132-142
197,224	81k	4/-	Do. Deb. 4% 1-197,224	100	102-105
50,000	10	10	Bristol & South Wales Railway Wagon, Nos. 1-50,000	3	54-6
~000	20	8	Bristol Wagon & Carriage Works Nos. 1-8,000	10	18-184
5,000	20	8	Do. 1st, Nos. 8,001-15,000	2	3-34
2,000	20	8	Do. 5 p.c. Participating Pref. Nos. 1-2,000	10	182-184
30,111	7	7/-	Gloucester Rail.-Car & Wagon, Ld., A, 1,20,861 & 49,751-50,000	7	104-105
44,889	7	3/6	Do. B, 20,862-49,750, 50,001-75,000	7	41-45
10,000	10	6/-	Lancashire and Yorkshire Wagon,...	10	124-13
14,567	10	12/-	Lancashire Wagon, Ord. ...	2	28-29
4,150	10	5/-	Do. do. Pref. ...	10	10-14
751,808	1	9d.	Metropolitan Amalgamated Rail.-Carriage & Wagon, Ld., 1-751,808	1	14 0-45 0
124,288	1	6d.	Do. Cum. A Pref. 5% 1-124,288	1	21 0-21 6
235,000	1	7 1/2d.	Do. Cum. B Pref. 6% 1-235,000	1	28 1/2-29 1/2
200,000	20	20/-	Midland Rail.-Car & Wagon, Ld., 1-200,000	10	204-214
10,000	6	10	Western Wagon and Property Nos. 1-10,000	6	12-12 1/2
40,000	6	10	Do. Nos. 10,001-50,000	2	44-44 1/2

Oil Engines for Marine Propulsion.

VERY welcome to mechanical engineers will be the new edition just published of Bertin's work, on marine boilers, which as Sir William White, K.C.B., reminds us in his preface to the first edition, originated in a course of lectures given to the students of the Ecole d'Application du Genie Maritime. As to the merits of the work, which is freely illustrated, it is sufficient to note that in the opinion of this eminent authority, it is of interest and value to both marine engineers and naval architects.

As compared with the English text books, the work which has been very ably translated and edited by Mr. Leslie Robertson, chiefly appeals to us by reason of the completeness of its sections on tubulous boilers. Over and above this we have in the present edition a lucid chapter on liquid fuel, by Engineer-Lieutenant H. C. Anstey, R.N., A.M.Inst.C.E., M.Inst.M.E., who, dealing with the possibilities of oil engines for the propulsion of ships, points out that it would be possible to give a ship the same radius of action if driven by oil engines, with only about one-third to one-fifth the quantity of fuel required by steam engines of the same power. Up to the present, however, oil engines have only been applied to the propulsion of vessels of small size, and the following difficulties stand in the way of their immediate application as motive power for larger vessels, viz., those of handling, reversing, regulation of speed, and the necessary experience with large sizes. As to the disposal of these difficulties, we quote

Lieutenant Anstey as follows:—"The purposes for which oil engines have mostly been applied require a constant speed in one direction only, so that the transition to the conditions of a marine engine, which requires to be stopped and started in either direction, will not be made without the exercise of considerable thought and inventive skill. In small boats the difficulty has been obviated by fitting either feathering screws, or by clutch and gearing, the engine running continuously in one direction at a nearly constant speed. These devices, however, it will be generally admitted, are not such as can be employed in the transmission of large powers. In the Bertheau engine, which has been fitted to boats in this country by Messrs. Thornycroft, the problem of reversing has been solved satisfactorily. The engine is operated at starting by compressed gas from a reservoir, which is kept charged, while the engine is running, by a portion of the products of combustion flowing out of the cylinder during the explosion stroke through a non-return valve into the reservoir. At starting, the cylinders take the compressed gas at the beginning of every downward stroke, but when once started all the cylinders but one are made to operate on the usual four-stroke cycle till the ignition is regular, and when this is obtained the remaining cylinder is made to work in the same manner. The various operations are effected by an ingenious arrangement of cams, and the results of trials have shown that an engine working on this principle is as handy and as reliable as a steam engine. The disadvantages of the system for large powers are the comparatively large size of gas reservoirs and the possibilities of losing the pressure in them.

The difficulty of regulation of speed will disappear probably with experience, since owing to land requirements being for constant speed engines little attention has been given to this point.

In the matter of size, progress, no doubt, will be slow. The largest power in a single oil engine cylinder constructed at the present time is 160 b.h.p., and so far as is known this size has only been attained in the Diesel and Hornsby engines, both of which types can use liquid fuel. By multiplication of cylinders much larger powers will, of course, be obtained, and so long as oil engines are made to work on the four-stroke cycle, that is to say, giving only one working stroke per cylinder every two revolutions, probably not less than four cylinders will be required on one shaft to ensure readiness of starting and a fairly uniform turning moment. Assuming, therefore, that the difficulties referred to can be overcome satisfactorily in large sizes, there are great possibilities for the use of the oil engines for propulsion. Some saving in weight may be expected over an ordinary steam installation, and considerable saving in space owing to absence of boilers. There will also be a large reduction in the weight of fuel carried and a very large saving in personnel; while, owing to the higher efficiency of the oil engine, the cost of fuel will not be greater, if a cheap fuel oil is procurable.

Marine Boilers: their construction and working, dealing more especially with tubulous boilers. Based on the work by L. E. Bertin. Translated and edited by Leslie S. Robertson. Second edition, revised and enlarged, with upwards of 350 illustrations. 21s. John Murray.

New Patents Applied For.

Engineering—Civil, Mechanical, etc.

- AIR COMPRESSORS.**—A. J. Dudgeon, London. Improvements in or relating to valves for air compressors blowing engines or the like. 4,209.
- ARMOUR PLATES.**—R. A. Hadfield, London. Improvements in the manufacture of armour plates, shields and the like. 4,107.
- BELT FASTENERS.**—L. Smith, Kent. An improved belt fastener. 4,354.
- D. B. Thomas and F. L. Bishop, London. Improvements in belt fasteners. 4,580.
- BELT LACING.**—S. Freeze, New Brunswick. Belt lacing tool. 4,039.
- BOILERS.**—F. W. Clayton, Manchester. Improvements in non-conducting coverings for steam pipes, boilers, cylinders and other similar structures. 4,342.
- BORING MACHINES.**—S. E. Alley, Glasgow. Improvements in horizontal surfacing and boring mills. 4,155.
- J. G. Stirk, London. Improvements in electrically-driven boring and turning mills, slotting, shaping, planing, punching and shearing machines or the like. 4,272.
- CONDENSERS.**—G. J. Shaw, London. Improvements in exhaust steam condensers and return water systems. 4,239.
- CARRIAGES.**—J. D. Hill, Nottingham. Improvements in devices for coupling and uncoupling railway wagons, and like vehicles. 4,016.
- H. Thorne, Queensland. Self-acting coupling for railway rolling stock. 4,041.
- CHIMNEY FLUES.**—C. L. Richards, A. Richards, W. Worth and J. Edlin, Leicester. Arrangement for one or more chimney flues and the like on the down draught system to enter into a main flue which enters an uptake chimney. 4,200.
- CRANES.**—W. Sherr, Manchester. Improvements in cranes. 4,144.
- Electric Cranes, Ltd. and C. B. Walker, Birmingham. Improvements connected with electric motors, particularly those working cranes, lifts and such like. 4,530.
- Cowans, Sheldon and Co., Ltd., and J. W. Branstion Carlisle. Compensating device for cranes. 4,027.
- CRUSHING ROLLS.**—R. A. Hadfield, London. Improvements in or relating to crushing rolls. 4,393.
- DIE PRESSES.**—E. W. Savory, London. Improvements in and relating to die presses. 4,594.
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- C. Bingham, London. Improvements in electric furnaces. 4,336.
- F. Clough, Halifax. Improvements in boiler. 4,426.
- GAS ENGINES.**—W. P. Thompson, Liverpool. Improvements in gas engines. 4,196.
- GAS PRODUCERS.**—F. Müller, Liverpool. Improvements in gas producers. 4,277.
- GAS VALVES.**—R. N. Ockman, London. Apparatus for opening and closing gas valves at a distance. 4,175.
- HACK SAW MACHINES.**—D. Rigby, Blackpool. Improvements in hack-saw machines for hand or power. 4,544.
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- METAL FORGING MACHINES.**—G. Hamilton, London. Improvement in combined metal forging machines and presses. 4,129.
- MOTOR BOATS.**—J. H. Collie, Liverpool. Improvements in motor boats. 4,309.
- PUMPS.**—F. S. Cripps, Worthing. Improvements in pumps. 4,024.
- ROTARY CUTTERS.**—W. H. Hancock, London. Improvements in rotary cutters for planing machines. 4,225.
- ROTARY ENGINES.**—R. C. McLean, London. Improvements in rotary engines. 4,499.
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- STEAM TRAPS.**—J. K. Appleby, London, and R. P. Dodd, London. A steam trap. 4,061.
- TURBINES.**—J. G. Atkinson, London. Apparatus for gas or steam pressure turbine. 4,156.
- WINDING APPARATUS.**—A. McArthur, Berwick. Winding apparatus for chains or cables. 4,370.

Shipbuilding, etc.

- CAPSTANS.**—Clarke, Chapman and Co., Ltd. H. Walker, and G. W. Money, London. Improvements in and means or apparatus for driving and controlling electrically-operated capstans, hoists, and like hauling and winding apparatus. 4,200.
- CAPSTAN DRIVING.**—J. E. Thornycroft and J. I. Thornycroft and Co., Ltd., London. Improvements in motor boat driving. 4,200.
- LIFEBOAT.**—R. A. Lawson, Cheshire. Collapsible lifeboat. 4,200.
- LIFTING.**—F. Little, Newcastle-on-Tyne. Portable apparatus for lifting motor and other vehicles and boats. 4,243.
- MOTOR BOATS.**—H. C. Brasier, Manchester. Improvements in driving gear for motor boats. 4,458.
- PROPELLERS.**—T. Goldsbrough, London. Improvements in the blades of screw propellers. 4,325.
- PROPELLING VESSELS.**—F. W. Schroeder, London. Improved method of propelling vessels and apparatus therefor. 4,231.
- SOUNDING APPARATUS.**—J. W. Gillie, North Shields. Improvements in marine sounding apparatus. 4,430.
- STEAMSHIPS.**—J. Reid, London. Improvements in steamships. 4,432.
- STEERING.**—V. Tatarinoff, London. New or improved method of and means for steering warships and other vessels. 4,460.
- SUBMARINES.**—H. J. Fisher, London. Improvements in or relating to submarine vessels. 4,110.
- TELEGRAPHIC.**—J. H. Collie, Liverpool. Improvements in engine room telegraphs and the like. 4,449.
- Chadburn's (Ship) Telegraph Company, Ltd., and A. J. Grant, Liverpool. Improvements in ships' telegraphic apparatus for transmitting orders, notifications or the like, from one part of same to another. 4,606.
- TORPEDO DEFENCE.**—Soc. Anon. des Forges et Chantiers de la Méditerranée, London. Improvements relating to protecting devices against torpedo attacks. 4,205.

Information for Firms Seeking Trade Abroad.

Board of Trade.—The Intelligence Branch of the Commercial Department of the Board of Trade (No. 73, Basinghall Street, London, E.C.) is intended to be a centre at which information on all subjects of commercial interest shall be collected and focussed in a form convenient for reference, and at which, so far as the interests of British trade permit, replies shall be given to inquiries by traders on commercial matters.

India.—The India Trade Inquiry Office at 73, Basinghall Street, London, E.C., has been established for the purpose of supplying the general public with all available information as to the commercial products, manufactures, and trades of British India.

The office is under the superintendence of an India Office official, who is in daily attendance to answer personal or written inquiries.

Canada.—The Canadian Government have secured premises at 73, Basinghall Street, London, E.C., where an office has been opened under the designation of "Canadian Government City Trade Branch," for the convenience of the commercial community.

Cape of Good Hope.—The Government of the Cape of Good Hope have opened offices at 73, Basinghall Street, London, E.C., for the purpose of a Commercial Agency for that Colony, under the direction of the Agent-General.

The Commercial Agent in charge deals with, and supplies free, information on trade subjects connected with the colony, such as commercial products, industries, trade, tariff regulations, commercial statistics, railway rates, prospects for emigration, etc.

Queensland.—For the convenience of the commercial community in the City of London, the Agent-General for Queensland has opened a branch office at 73, Basinghall Street, London, E.C., where a representative attends daily to give information to inquirers regarding trade, mining, and all other matters in connection with Queensland.

New Catalogues.

R. Waygood and Co., Ltd., London and Coventry. A well-printed and illustrated pamphlet is devoted to various types of service and passenger lifts—chiefly hydraulic and electric. The different types of gears are shown and some very interesting crane installations are illustrated, notably a hydraulic lifting and revolving crane erected by the firm at the Fishmongers' Hall Wharf on London Bridge. From a small pamphlet entitled "Facts Worth Noting," we observe that the firm erect over 1,000 lifts and cranes every year.

The Brush Electrical Engineering Company, Ltd., Loughborough. The February Brush Budget recording the progress of the firm has a good description of the brush turbine, with special reference to the brush turbo-alternator added to the Willesden power plant.

Books Received.

"Injectors: Their Theory, Construction, and Working." By W. W. F. Pullen, M.E. Mech. E., A.M.I.M.E. Third edition. Technical Publishing Co., Ltd. 5s. 6d. net.

"Transactions of the G.W.R. Junior Engineering Society, 1904-5." Edited by E. G. Ireland. Published by the Society, G.W.R. Locomotive Department, Swindon. 5s.

"Calendar of the University of Toronto for the year 1905-6." University Press.

"Note on the Use of the Bolometer as a Detector of Electric Waves." By Lieutenant C. Tissot. Issued by the Institution of Electrical Engineers.

Forthcoming Exhibitions.

Secretaries and others are requested to give the Editor early information as to forthcoming Exhibitions, &c. for notification in this column.

A South African Exhibition in London.—Preliminary arrangements have been completed for holding a British South African Exhibition in London early next year. The committee consists of the Agents-General for Cape Colony and Natal, Sir Lewis Michell, Mr. Lewis Atkinson, Commercial Agent for the Cape Government, and Captain Bam, a member of the Cape Parliament. An attempt is to be made to secure the active co-operation of all the South African States. Dr. Jameson, Mr. Maydon, Mr. Hosken, Mr. Jagger, and Mr. H. F. Wilson, colonial delegates to the Shipping Conference, have expressed their readiness to lend support to the movement.

New Zealand.—The opening of the International Exhibition to be held at Christchurch, New Zealand, has been fixed for November 1st, 1906, and the closing for April 15th, 1907.

Bavaria.—The Bavarian Jubilee Exhibition of Trades, Industry, Arts and Crafts at Nuremberg ("Bayerische Jubiläums, Landes, Industrie, Gewerbe und Kunstausstellung") will be held from May to October, 1906.

Madrid.—The "Unión Ibero Americana" has a concession to hold an International Exhibition in Madrid in 1908. The concession will lapse unless a commencement is made with the exhibition buildings within six months of the publication of the decree, and unless the sum of £32,000 is guaranteed for the completion of the building.

Amsterdam.—A Dutch institution, entitled the International and Industrial Exhibition and Sale Society, is organising at Amsterdam a permanent industrial exhibition where foreign manufacturers will be able to display their goods, and make them known to the Dutch public. The Society not only undertakes the organisation and upkeep of this exhibition, but is also prepared to act as agents for the sale of goods.

United Kingdom.—An International Engineering and Machinery Exhibition is to be held at Olympia, London, W., from September 15th to October 17th next.

MEETINGS, ETC., FOR THE ENSUING WEEK.

FRIDAY, MARCH 9.—Faraday House Old Students' Association. Second Annual Dinner at the Florence Restaurant, 7 p.m. Physical Society, Royal College of Science. Papers: "The Velocities of the Ions of Alkali Salt Vapours at High Temperatures," by Professor H. A. Wilson; "Some Experiments on Earth Currents at Kew Observatory," by Dr. Harker.—Institution of Electrical Engineers, Manchester Students' Section. Royal Technical Institute, Salford. 7.30. Paper, "Modern Primary Batteries" by E. Muller and J. Davies.

SATURDAY, MARCH 10.—Institution of Electrical Engineers, Students' Section. Visit to Messrs. Elliott Bros' Works at Lewisham.—Royal Institution. Afternoon Lecture II, on "The Corpuscular Theory of Matter," by Professor I. J. Thomson, F.R.S.—Junior Institution of Engineers, Conversazione at the Westminster Palace Hotel, 7 p.m.—Birmingham and District Electric Club, Colonnade Hotel, New Street. Paper, "Electricity in Mines," by R. G. Mercer. 7.30.—Manchester Association of Engineers. Paper by Mr. J. N. Bickerton, Ashton-under-Lyne, "Gas, Oil, and Petrol Engines."

MONDAY, MARCH 12.—Institute of Marine Engineers. "Reminiscences of Marine Engineering," by Mr. W. C. Roberts.—The Institution of Mechanical Engineers, Graduates' Association Storey's Gate, St. James' Park, W. Paper and Discussions. "Notes on Large Gas Engines," by Mr. J. H. Hurst.

TUESDAY, MARCH 13.—Institution of Civil Engineers, Great George Street, S.W., 8 p.m.

WEDNESDAY, MARCH 14.—Association of Engineers-in-Charge. Paper, "Ventilation of Public Buildings," by Mr. George Hibby.

THURSDAY, MARCH 15.—Royal Society, Burlington House, Meeting, 4.30 p.m.

FRIDAY, MARCH 16.—Institution of Mechanical Engineers. Ordinary Meeting, 8 p.m.

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Miscellaneous

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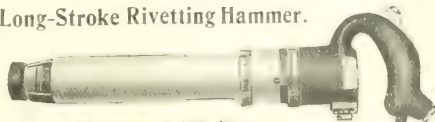
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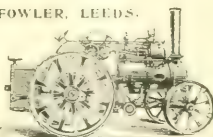
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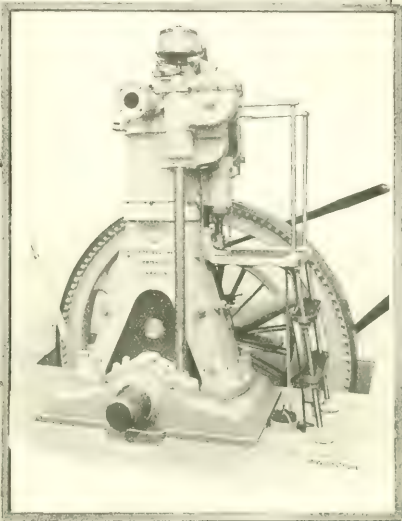
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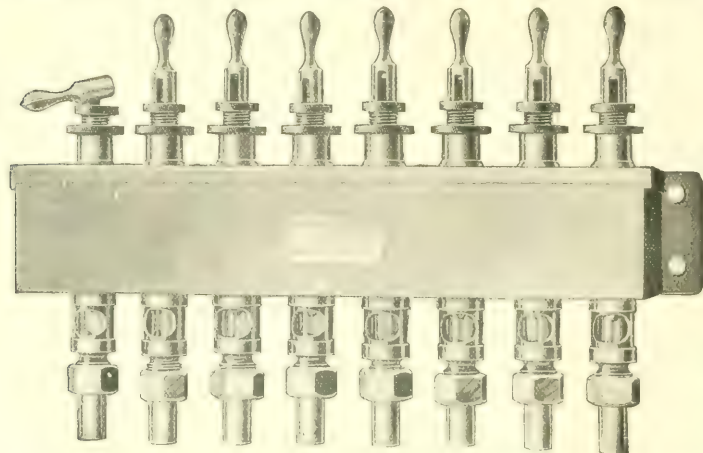
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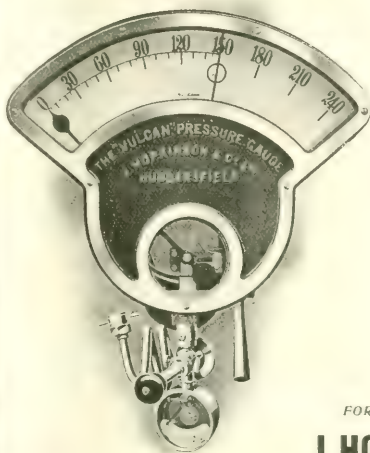
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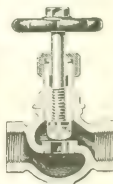
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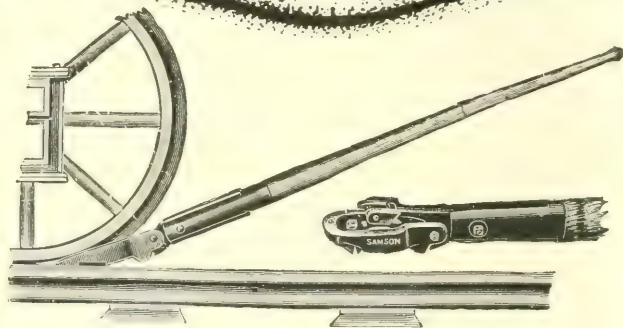
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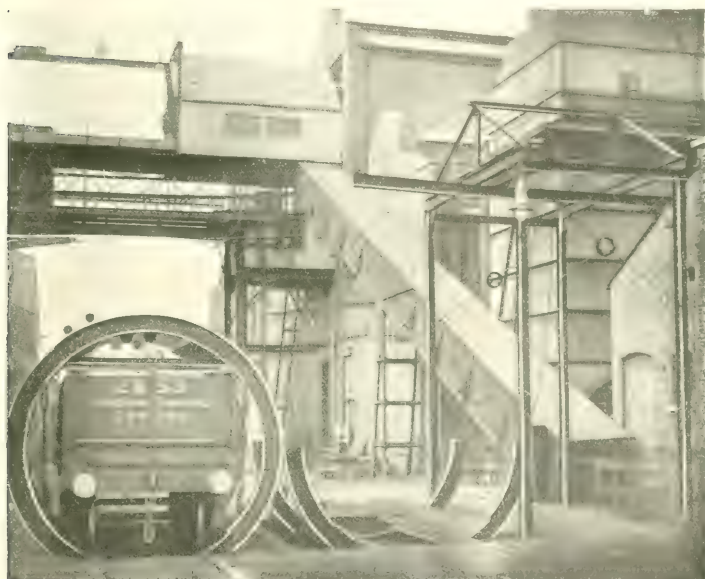
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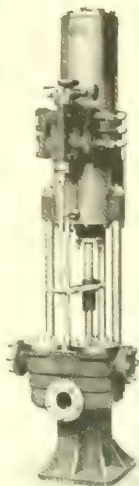
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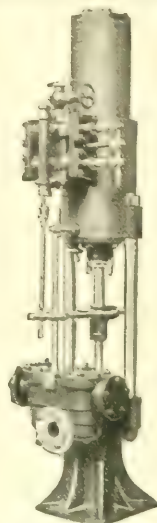
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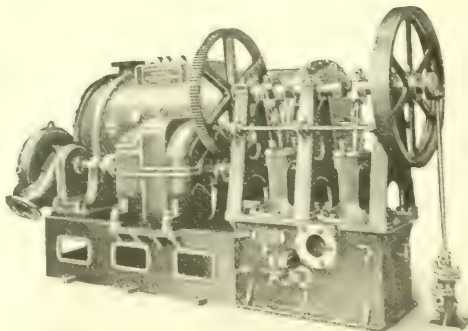
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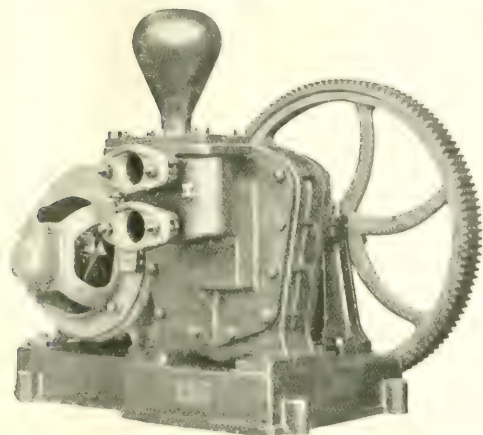
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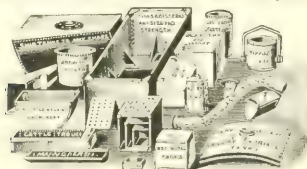


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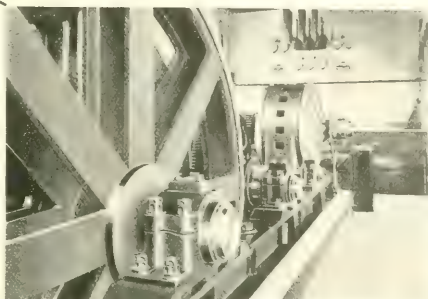
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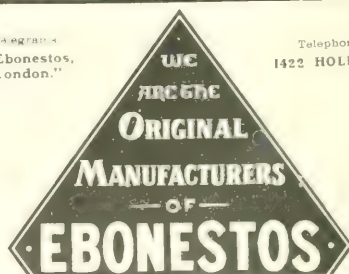
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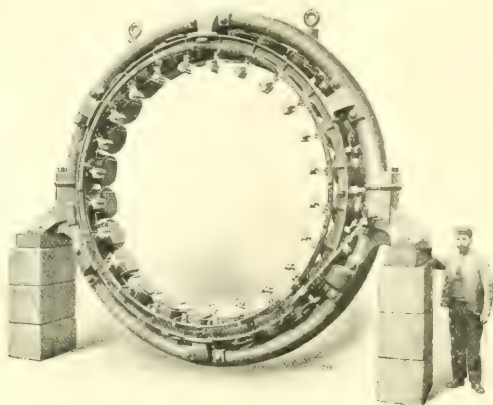


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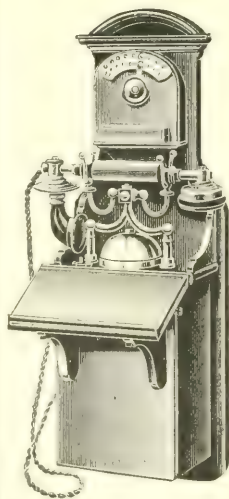
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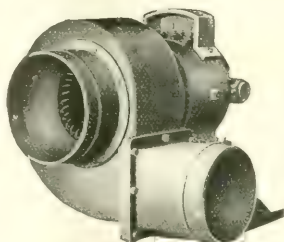
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Being very compact it is very suitable for erection in confined spaces.

for
Ventilating

Ships,
Mines,
Buildings,
Workshops.

Write for our Catalogue P 305.

Davidson & Co., Ltd.,

Sirocco Engineering Works,
Belfast.

JOHN GIBBS & SON

Ventilating Engineers,

80, JUKE STREET,

LIVERPOOL.

Still say Advertising does not pay.

SEE OUR ILLUSTRATED
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WEEK.



This picture represents an Electrical Engineering Works in Yorkshire which is specially laid out for the manufacture of Dynamos, Motors, Switches, and Switchboards. Everything is the best, and prices are the lowest possible, consistent with best material and work-

Note the Name and Address:

T. W. BROADBENT,
Victoria Electrical Works,
EAST PARADE, HUDDERSFIELD.

JOHN SWAIN & SON LTD

Specialists in the production of
HIGH CLASS ILLUSTRATED CATALOGUES
ADVERTISEMENT SHOW CARDS etc

SEE OUR SPECIMEN
HALF TON
THREE COLOUR
WOOD ENGRAVING
LINE E.C.

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LONDON E.C.

PAGE'S WEEKLY

Printing, &c.

Arthur Stafford & Co.

Read what the
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the Printing and
Kindred Trades, says
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"An illustrated
Catalogue printed by
Messrs ARTHUR
STAFFORD & CO.,
Denton, is a decidedly
up-to-date specimen
of typography and
half-tone printing,
and reflects the
highest credit on the
producers."

"An extremely
tasteful piece of work,
perfectly produced."

HIGH GRADE PRINTERS

of Engineers' Catalogues, &c.,
at the Best Prices.

Modern
Printing
for
Modern
People.

Central Printing Works, DENTON,
MANCHESTER.

ORDOVERAX

THE

New True Scale Photo Process.

ENGINEER'S TRACINGS CAN BE COPIED ON
TRACING CLOTH, DRAWING PAPER, WHITE CLOTH.

No Washing. No Shrinkage. Twelve Copies for One Exposure.

We make the Copies or sell Complete Outfits.

B. J. HALL & CO., Ltd.,

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and ACCESSORIES —
DATING, TIMING & NUMBERING STAMPS

RUBBER STAMP COMPANY
The Commercial Stamp Makers
BIRMINGHAM.

SPECIAL QUICK DRYING AND OPAQUE INKS.

BUSINESS SYSTEMS.

Cut out this Coupon and indicate in the list below what
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ROCKWELL-WABASH CO., Ltd.,
69, Milton Street, London, E.C.,
who will send you Information Forms relating to same.

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| 1. Factory Costs | 14. Credit Systems |
| 2. Stores Ledgers | 15. Shipment Register |
| 3. Perpetual Card Ledgers | 16. Printing Catalogues |
| 4. Quotations System | 17. Printing Contracts |
| 5. Quotations—Received | 18. Printing Invoices |
| 6. Advertising Records for Advertisers | 19. Pattern Records |
| 7. Advertising Records for Agents | 20. Drawing Records |
| 8. Advertising Records for Publishers | 21. Office Systems |
| 9. Staff Register | 22. Doctors, Dentists, and Opticians |
| 10. Customer's Lists | 23. Membership Records |
| 11. Addressing Lists | 24. Insurance Recordation |
| 12. Follow-Up Systems—Sales | 25. Insurance Records—Foreign |
| 13. Follow-Up Systems—Overseas Accounts | 26. Insurance Records for Agents |



Whether you are selling machinery or service, you can make use of Advertising (in its widest sense) by some means or other.

Judicious Advertising, properly planned and with due consideration to professional etiquette, can be made as profitable to you as to the soapmaker, the merchant, and the proprietor of trade-marked articles.

It is our business to evolve selling and advertising for every legitimate business, to prepare and place press advertising (when necessary), to design, write, and print catalogues and literature that will sell goods.

During the past year, 51 prominent firms have availed themselves of our services—17 being new to advertising.

We shall be pleased to show you specimens of work successfully done, that have brought profit to our clients.

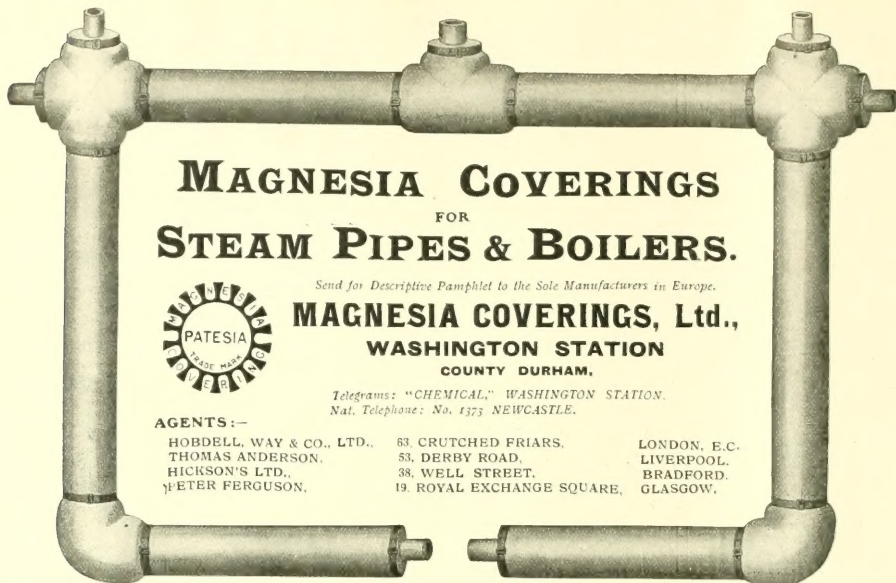
If our proposals are of interest to you, write for further information to

SERVICE
FOR
ENGINEERS,
ETC.

The Spottiswoode Advertising Agency,
Oswaldestre House,
Norfolk Street, Strand, LONDON.
LTD.,

PAGE'S WEEKLY

Miscellaneous



MAGNESIA COVERINGS

FOR

STEAM PIPES & BOILERS.

Send for Descriptive Pamphlet to the Sole Manufacturers in Europe.

MAGNESIA COVERINGS, Ltd.,

WASHINGTON STATION

COUNTY DURHAM.

Telegrams: "CHEMICAL," WASHINGTON STATION.
Nat. Telephone: No. 1373 NEWCASTLE.

AGENTS:—

HOBDELL, WAY & CO., LTD.,	63, CRUTCHED FRIARS.	LONDON, E.C.
THOMAS ANDERSON,	53, DERBY ROAD,	LIVERPOOL.
HICKSON'S LTD.,	38, WELL STREET,	BRADFORD.
PETER FERGUSON,	19, ROYAL EXCHANGE SQUARE,	GLASGOW.

W. C. HOLMES & Co.,

ENGINEERS.

Sole Makers of the . .

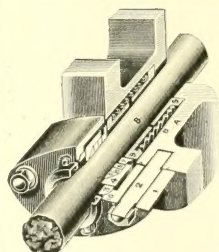
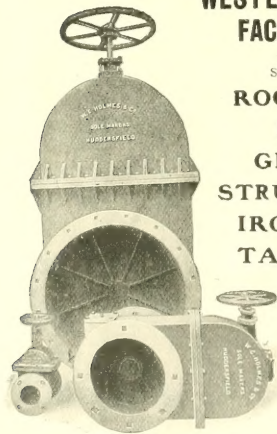
"WESTERN" DOUBLE
FACED VALVE.

SPECIALITIES:—

ROOFS,
BRIDGES,
GIRDERS,
STRUCTURAL
IRON WORK,
TANKS, &c.

Works—
Huddersfield.

London Office—
11, Victoria
Street, S.W.



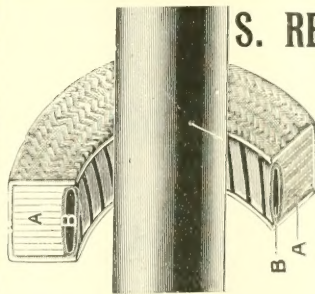
LOCOMOTIVE PACKING.

The Sun never
sets on the . .

UNITED STATES
METALLIC PACKING.

Used all over the World

SOHO WORKS,
BRADFORD.



S. REDFERN,

Swan Lane,
New Brown St.
MANCHESTER.

METAL FACED
PACKING

Insures less friction
on the rods, and
therefore less wear
and tear.

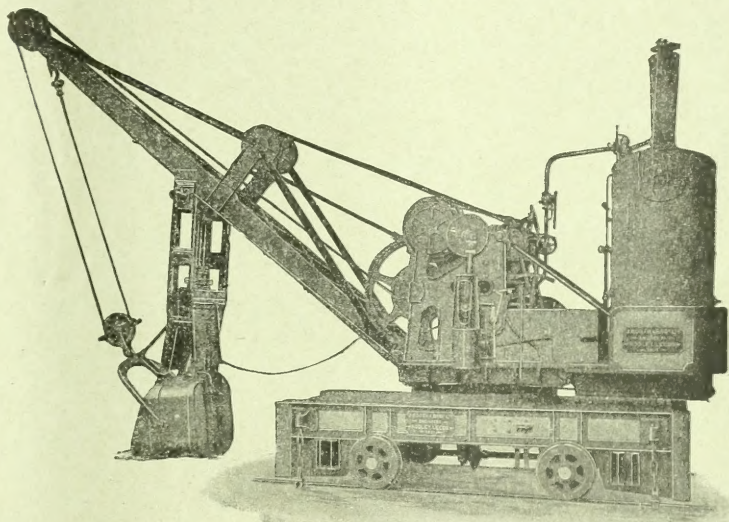
JOSEPH BOOTH & BROS.

LTD.,

Rodley, LEEDS,

For Cranes and Lifting Machinery, &c.

Telegrams : "Cranes, Rodley."
Nat. Telephone : Leeds District, Stanningley 20.



20 Tons Steam Locomotive Cranes with Excavator.

Locomotive Cranes
Overhead Cranes
Goliath Cranes
Wharf Cranes
Derrick Cranes

WORKED BY

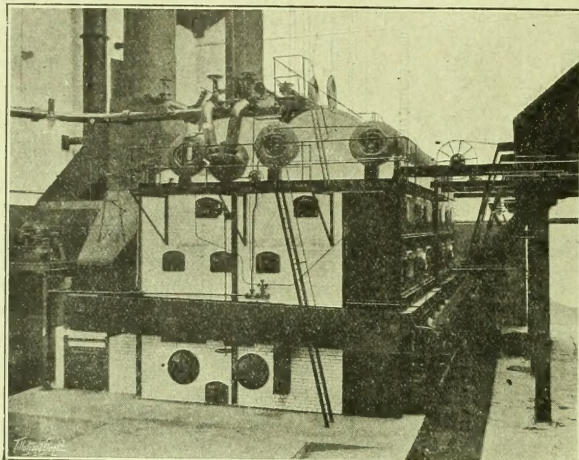
Electricity,
Steam,
Hydraulic
Power,
Air, or
Hand.

Makers to Home, Colonial, and Foreign Governments.

Crown Agents for Colonies and all the Leading Firms in Great Britain.

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COUNTY COUNCIL
TRAMWAYS
24 BOILERS**

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WESTMINSTER,
S.W.

CONTRACTORS TO HIS MAJESTY'S AND OTHER GOVERNMENTS.

JAMES FAIRLEY & SONS, General Steel Manufacturers, and SPECIALISTS in . . . **TOOL STEELS**

Invite attention to their Unrivalled Self-hardening Steel.

FAIRLEY'S SELF-HARDENING TOOL STEEL FOR HEAVY CUTS AT HIGH SPEEDS.

Is considered to be the HARDEST and TOUGHEST Steel yet made (although the cheapest in the Market). Small samples free to approved buyers.

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All Communications should be addressed to the Head Offices:—

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Telegrams: "Gauze."

ESTABLISHED 1790.

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Manchester Wire Works, **MANCHESTER.**

Wire Weavers and Perforators of all Metals.